



Imperial Bureau of Plant Breeding and Genetics

Plant Breeding Abstracts

Vol. IX, No. 1.

(Abstracts Nos 1—548)

School of Agriculture
Cambridge
England

TABLE OF CONTENTS.

		PAGE
519	Statistics* (Empire)	1
	(Foreign)	22
575	Breeding* (Empire)	1
	(Foreign)	22
575.1	Genetics* (Empire)	2
	(Foreign)	24
576.12	Evolution (Empire)	3
	(Foreign)	27
576.16	Origin of Species, etc.	27
576.3	Cytology* (Empire)	4
	(Foreign)	28
58	Botany*	33
63	Agriculture	34
631.421	Field Tests (Empire)	6
	(Foreign)	35
631.5	Agricultural Operations	7
632	Plant Diseases*	37
633	Economic Plants (Empire)	8
	(Foreign)	38
633.1	Cereals	40
633.11	Wheat (Empire)	8
	(Foreign)	40
633.12	Buckwheat	56
633.13	Oats (Empire)	9
	(Foreign)	57
633.14	Rye	61
633.15	Maize	62
633.16	Barley	67
633.17	Millets and Sorghums (Empire)	10
	(Foreign)	70
633.18	Rice (Empire)	10
	(Foreign)	70
633.2/3	Herbaceous and Leguminous Forage Plants	72
633.4	Roots and Tubers (Empire)	11
	(Foreign)	76
633.5	Fibres (Empire)	12
	(Foreign)	83
633.6	Sugar Plants (Empire)	14
	(Foreign)	88
633.7	Stimulants (Empire)	15
	(Foreign)	95
633.8	Aromatic Plants	102
633.85	Oil Plants	106
633.88	Medicinal Plants	107
633.91	Rubber Plants (Empire)	19
	(Foreign)	107
633.94	Turpentine and Resin Plants	110
633.95	Sap Plants	110
634	Fruit Trees (Empire)	19
	(Foreign)	110
634.3	Citrus Fruits	114
634.4	Various Small Fruits	116
634.5	Nuts	117
634.6	Palmaceous and Other Fruits (Empire)	19
	(Foreign)	117
634.7	Small Bush Fruits (Empire)	20
	(Foreign)	118
634.8	Viticulture	120
634.9	Forestry (Empire)	20
	(Foreign)	123
635	Vegetables (Empire)	21
	(Foreign)	127
	Book Reviews	141
	New Journal	151

Note.—Initialled abstracts are written by the following:—

Mr J. L. Fyfe	J. L. F.
Mr J. G. Hawkes	J. G. H.
Dr B. P. Pal	B. P. P.
Dr J. Wishart	J. W.

* General studies, see also individual crops.

Plant Breeding Abstracts.

Vol. IX, No. 1.

Part 1. Empire Section

STATISTICS 519

1. COCHRAN, W. G. 519.24
The omission or addition of an independent variate in multiple linear regression.

Suppl. J.R. Statist. Soc. 1938 : 5 : 171-76.

In problems of multiple linear regression, it is sometimes desired to omit one or more independent variates after the full calculation has been performed, or alternatively, to bring in a new variate. Methods of adjusting the coefficients in such cases without performing the calculations afresh are described and illustrated.

J. W.

2. YATES, F. 519.24
Orthogonal functions and tests of significance in the analysis of variance.

Suppl. J.R. Statist. Soc. 1938 : 5 : 177-80.

When the influence of a number of effects on a dependent variable is being sought, it is sometimes desired to make a comprehensive test of significance for some of them, making due allowance for the others. The procedure is to find the difference of the reduction in the sum of squares due to the regression on all variates, and that due to the regression on the selected variates only. The validity of this procedure is demonstrated by means of the introduction of variates, which are orthogonal to the original independent variates. J. W.

3. FISHER, R. A. 519.24:631.421
The mathematics of experimentation.

Nature, Lond. 1938 : 142 : 442-43.

A report of a discussion on experimental design at the Cambridge meeting of the British Association, including a brief account of a paper by Yates on the lattice square, a design particularly suitable for the testing of large numbers of varieties.

BREEDING 575

4. H., A. G. 575:633(6)
The improvement of native food crops.

E. Afr. Agric. J. 1938 : 4 : 81-83.

An editorial stressing the importance of breeding work with native food crops, the improvement of which is considered second in importance only to the maintenance of soil fertility as an agricultural problem in the native areas of tropical Africa. The probable objectives and difficulties are discussed.

5. HOSKING, H. R. 575:633(67.61)
The improvement of native food crop production by selection and breeding in Uganda.

E. Afr. Agric. J. 1938 : 4 : 84-88.

The characteristics of the native food crops of Uganda are briefly described, with indications of their relative importance and nutritional value.

In *Eleusine coracana* (finger millet) selection work is concentrated on high yield, early maturity, strong straw, and resistance to rice blast and to drought. The yield capacities of the different varieties have been studied. Little evidence of resistance to rice blast has been found. A

weed locally known as Ekitu, which occurs in *Eleusine* plots is being studied. It is indistinguishable from the crop until it flowers and is being crossed with the latter with the object of studying their relationship.

Selection work with sorghum is conducted with two aims, the production of high-yielding food varieties and the selection of strains suitable for silage for cattle feed. A collection of varieties is grown at Serere and in 1937 a preliminary variety trial was held there.

With groundnuts the chief aim is to produce high-yielding strains resistant to rosette disease and with a high shelling out-turn. It is doubtful whether resistance to rosette disease exists. Selection is performed with both spreading and bunch types. The best bunch selection so far obtained is derived from the South African Spanish No. 68/6.

A collection of varieties of cassava is being grown at Serere and variety trials are held and observations made on susceptibility to mosaic disease, time to ripen, yield and palatability. To supplement the pulses already grown, *Vigna catjang* and *Cajanus indicus*, such legumes as *Canavalia ensiformis*, *Stizolobium* and soya bean have been introduced and efforts are being made to popularize them.

- | | | |
|----|--|-------------------------|
| 6. | | 575:633(67.62) |
| | | 633.682-2.8-1.521.6:575 |
| | | 633.682 Malindi |

HUMPHREY, N.

Food crops and food shortage. A review of work being done in the coastal districts of Kenya.

E. Afr. Agric. J. 1938 : 4 : 106-09.

An account of efforts to remedy the food crop position in the coastal districts of Kenya. A drought-resistant variety of maize, Durum, has been introduced and Dwarf Hegari sorghum, a very early maturing variety. Among the millets the Awned Bulrush Millet from Tanganyika has given good results, as has an early selection of *Eleusine* from Nyanza. Foxtail Millet has been under trial and selection for yield and awns (to keep off birds) is being carried out. Binti Athman, a local variety of cassava shows some tolerance of mosaic and Shelli-Shelli from the Seychelles has some resistance. The author found a resistant plant in a native plot, and from this a highly resistant variety, Malindi, was produced. Seedlings from Malindi are also being studied.

The New Era variety of cowpea has proved very popular and selection is being carried on in tepary beans. The cluster bean is also under trial.

- | | | |
|----|---|-------------|
| 7. | SAUNDERS, A. R.
Plant breeding. | 575:633(68) |
|----|---|-------------|

S. Afr. J. Sci. 1937 : 33 : 390-98.

A lecture dealing with the importance of plant breeding for South Africa and the aims and results already achieved with such crops as maize, sorghums, cowpeas, soya beans, wheat, peanuts and potatoes are briefly recorded.

- | | | |
|----|---|---------------|
| 8. | RAYMOND, L. C.
The relationship of the plant breeder to the grower in the province of Quebec. | 575:633(71.4) |
|----|---|---------------|

59th Annu. Rep. Ont. Agric. Exp. Un. 1938 : 43-47.

A brief account is given of the plant breeding work at Macdonald College on swedes and maize. F₁ varietal hybrids are being used for silage, the hybrid between the yellow flint variety, Quebec No. 28, and Wisconsin No. 7, for instance, being sold under the name Algonquin.

GENETICS 575.1

- | | | |
|----|--|-------|
| 9. | DARLINGTON, C. D.
The early hybridisers and the origins of genetics. | 575.1 |
|----|--|-------|

Herbertia 1937 : 63-69.

In reviewing the work of the early hybridizers and experimenters, the importance of the rerudescence of the ideas of determinism and the particulate nature of inheritance is emphasized. These basic ideas had been accepted by the early Greeks, but were obscured by the concept of the fixity of species during the Dark Ages.

10. NEK ALAM, Ch.
An important genetic constant.
Curr. Sci. 1938 : 7 : 58-59. 575.11-18

From the data of various workers the author has established the following relationship: the sum of the average values of a given quantitative character for both the parents and for the F_1 is approximately three times the average for the F_2 . Symbolically $A+B+F_1 = 3F_2$, where A and B are the respective average values for the parents. The relationship applies to any two succeeding generations, thus $A+B+F_2 = 3F_3$, $A+B+F_3 = 3F_4$ and so on.

11. SANSOME, F. W.
Time sequence of crossing-over.
Nature, Lond. 1938 : 142 : p. 358. 575.116.1:576.354.46

The author expresses some scepticism with regard to Mather's theory of localization of chiasmata (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 1383).

12. NORTON, H. W.
Optimum estimation of frequency of heterozygotes.
Ann. Eugen., Lond. 1938 : 8 : 402-06. 575.123:519.24

In many types of study of the genetics of populations, it is necessary to estimate the proportion of individuals heterozygous for a given gene among those of dominant type. Unless q (the proportion of heterozygotes) exceeds $\frac{2}{3}$, its value can be most efficiently estimated by growing one offspring from each of a large number of members of the population. Growing larger families from a correspondingly smaller number of individuals is less efficient.

Back-crossing is normally to be recommended, though when q exceeds $\frac{2}{3}$, intercrossing may be more convenient and gives roughly the same amount of information. If back-crossing is impossible, it should be noted that for low values of q , selfing is much more efficient than intercrossing.

13. NEK ALAM, CH.
Minimum adequate size of sample of F_2 required in experiments on hybrid vigour and inheritance of quantitative characters.
Curr. Sci. 1938 : 7 : 110-11. 575.125:575.113.4-18:519.2

The importance of an adequate size of sample in studies of hybrid vigour and the inheritance of quantitative characters is urged.

For hybrid vigour experiments, the F_2 may be used in comparison with the F_1 and parents in a randomized block or similar arrangement, providing that the sample size is sufficiently large to be representative. The sample size, the author concludes, is sufficiently large if the means of successive samples do not differ significantly from each other, and lie within the limits of the general mean \pm twice its standard error.

For experiments on quantitative characters, similar precautions should be taken, and the number of plants in a plot, it is suggested, should be at least 256 where four factor pairs are being studied, 1024 for five, 4096 for six, and so on, for the sample to be considered representative.

EVOLUTION 576.12

14. W , D. M. S.
The mechanism of evolution.
Nature, Lond. 1938 : 142 : 514-16. 576.12

A report of a discussion on this topic held during the Cambridge meeting of the British Association.

15. FRANKEL, O. H.
The evolution of cultivated plants. The Banks Lecture for 1938.
J. N.Z. Inst. Hort. 1938 : 8 : 27-34. 576.12:575.1:633

A brief survey of two ways in which our knowledge of the mechanism of evolution has been increased since Darwin's time. Vavilov's geographical method of determining the origin of

cultivated plants is described. The importance to plant breeders of the collections of crop plants made in all parts of the world by Vavilov and his co-workers is emphasized. The various ways in which heritable variations may arise are detailed, and it is pointed out that our increased knowledge of this subject also brings many new possibilities to the plant breeder.

CYTOLOGY 576.3

16. GATES, R. R. 576.312.34
The structure of the chromosome.
 J. Roy. Microscop. Soc. 1938 : 58 : 97–111.
 A survey of some of the evidence on the chromomere and chromonema hypotheses, the time of splitting of the chromosome, the number of threads in the chromosome at various stages, and the relationship between nucleoli and satellites.
 The author concludes that the mass of observational evidence indicates that somatic chromosomes are quadruple at metaphase and double at anaphase and telophase. X-ray evidence is conflicting and the detailed action of X-rays on the cell not sufficiently understood for much reliance to be placed on the method.
 Observation of the number of satellites at metaphase or of the maximum number of nucleoli at early telophase may prove to be a useful method of detecting primary and secondary polyploidy.
17. KOSTOFF, D. 576.354.46
 576.356.2
Heterochromatin, somatic “crossing-over” and the interchange hypothesis between non-homologous chromosomes.
 Proc. Indian Acad. Sci. 1938 : 8 : Sect. B : 11–44.
 KOSTOFF, D.
A contribution to the chromosome structure and behaviour.
 Cellule 1938 : 47 : 219–25.
 Heterochromatic regions often occur near the centromere and distal ends of chromosomes. They correspond with the genetically inert regions, and the author suggests that their retention of stain is due to the fact that in them the chromomeres are situated very close together. Since, therefore, the parts of the chromosome which have fewest genes have most chromomeres, it is suggested that the genic material is contained in the regions between the chromomeres.
 Heterochromatic regions are made more pronounced in appearance by chemical treatment, parasites, X-rays, temperature and certain other external agents.
 Fusion between heterochromatic regions of non-homologous chromosomes is observed in active glandular tissues, e.g. salivary glands. It is suggested that similar fusion accounts for the loose end-to-end pairing observed in haploid *Triticum monococcum*, and for the type of pairing observed in B-type and between non-homologous A-type chromosomes in maize.
 An account is given of somatic crossing-over in *Drosophila*, *Zea* and *Nicotiana*. This, in the author's opinion, is due to pairing between non-homologous chromosomes in their heterochromatic regions, followed by interchange of segments.
 The action of X-rays and ageing in inducing conjugation of non-homologous chromosomes is discussed in some detail.
 Details are given of certain changes in the karyotype in *Crepis* which may have arisen from somatic crossing-over in heterochromatic regions. It is pointed out that the mechanism may lead to duplication of segments and to other important changes in the chromosome complement.
18. KOSTOFF, D. 576.356.5; 575.22
Directed heritable variations conditioned by euploid chromosome alterations.
 J. Genet. 1938 : 36 : 447–68.
 The various methods now available for the artificial induction of polyploidy are briefly reviewed.

The following morphological changes appear to be generally produced by a doubling of the chromosome number: (1) Increase in cell dimensions and the size of the nuclei. (2) Increase in the breadth of the leaves in proportion to their length. (3) Increase in the thickness of the leaves. (4) Increase in the size and weight of seeds above the parental mean (where the seeds are normally filled).

The reverse changes are brought about by a decrease in the chromosome number (haploidy). Plant size and flower size may be increased or decreased by chromosome doubling, though haploids usually have smaller flowers and are smaller in size. Very high polyploids are usually dwarfed.

The vegetative period is usually increased by polyploidy. Plastid size and the distance between the cell wall and the nuclear membrane appear to be unaffected.

19. KOSTOFF, D. 576.356.5:581.04
Colchicine and acenaphthene as polyploidizing agents.

Nature, Lond. 1938 : 142 : p. 753.

Sublimating particles of acenaphthene act in the same way as colchicine in inducing polyploidy. Material may be treated by immersion in a saturated aqueous solution of acenaphthene with excess of crystals, or by enclosing it in a glass tube lined with the crystals. The latter may be deposited in the tube by dissolving them in ether and then allowing the ether to evaporate. Polyploid cells, sectors and whole shoots and plants were obtained in a large number of species and hybrids by these means. The effect of acenaphthene is increased with the amount of the sublimating particles and the time of exposure, but excessive exposure may injure or even kill the tissues.

20. KOSTOFF, D. 576.356.5:581.04:633.71
581.04:581.331.23
Irregular meiosis and abnormal pollen-tube growth induced by acenaphthene.

Curr. Sci. 1938 : 7 : 8-11.

- KOSTOFF, D.
Abnormal meiotic processes induced by acenaphthene.

C.R. (Doklady) Acad. Sci. U.R.S.S. 1938 : 20 : 169-71.

Acenaphthene crystals inhibit the regular formation of a spindle at meiosis in *Nicotiana*. The chromosomes are orientated irregularly, and not arranged in an equatorial plate, and on division either do not separate or separate into a number of irregular groups of varying size. Consequently polyploidy or heteroploidy might be induced. Pollen sterility is high. When applied to the stigmas, acenaphthene interferes with the normal growth of the pollen tubes, causing swellings to appear at the growing ends.

21. KOSTOFF, D. 576.356.5:581.04:633.71
Polyplid plants produced by colchicine and acenaphthene.

Curr. Sci. 1938 : 7 : 108-10.

Polyplid plants were obtained by treating various *Nicotiana* species and F_1 's with colchicine and acenaphthene, also in *Phlox* by colchicine treatment and in *Lactuca sativa* with acenaphthene.

Each polyplid had a longer period of vegetative growth, a character of economic significance in *Lactuca*. The leaves were thicker and broader, and of a darker green colour. Cell size was increased, the seeds were larger and the corolla tubes broader. Corolla tube length was increased in some cases, and decreased in others.

The author suggests that chromosome pairing and fertility are least disturbed in those auto-polyploids which have short chromosomes and a low chromosome number.

FIELD TESTS 631.421

22. HARTLEY, H. O. 631.421
Studentization and large-sample theory.
 Suppl. J.R. Statist. Soc. 1938 : 5 : 80-88.
 The point about this theoretical paper which will interest agricultural experimenters is that it is often desired, in modern experimental designs of the factorial type, to study such a problem as the significance of an effect measured by the largest of a number of mean squares into which total treatments have been divided. The ordinary z -test, comparing this mean square with error, is not applicable, and the fact that the error variance is only an estimate of the true value brings in a "studentized" problem, for which a solution is furnished by the author. J. W.
23. LANDER, P. E., 631.421
 NARAIN, RAMJI
 and AZMAT SINGH.
Soil uniformity trials in the Punjab, I.
 Indian J. Agric. Sci. 1938 : 8 : 271-307.
 The yield data from four soil-uniformity test crops grown at Rawalpindi are analysed statistically in order to throw light on the comparative behaviour of plots in yielding capacity in different seasons. Curves have been drawn after adjustment for comparative purposes, and fertility contour maps have been constructed. Determination of coefficients of variability, and the use of the analysis of variance, confirm that there is a good deal of variation from year to year, and the method of covariance shows that the precision of experiments with annual crops is not appreciably increased by using previous trial data from the same plots. It is shown also that the experimental error can be considerably reduced by adopting suitable methods of lay-out. The conclusion is reached that uniformity trials have only a limited value in deciding the best form of experimental lay-out for subsequent seasons. J. W.
24. PEARSON, E. S. 631.421
Some aspects of the problem of randomization. II. An illustration of "Student's" inquiry into the effect of "balancing" in agricultural experiments.
 Biometrika 1938 : 30 : 159-79.
 The argument of this paper serves to make clear the points of a previous paper by "Student" in which balanced arrangements in field experimentation are compared with random arrangements. An experimental study is made of a number of uniformity trial lay-outs, with and without imposed hypothetical treatment differences, and the results are shown in a series of power function curves. The main point is that in weighing up the consequences of using a given experimental design and applying a statistical test to the results of the experiment, it is of more importance to consider the chance of detecting real differences when they exist than the risk of concluding that a difference exists when it does not. J. W.
25. YATES, F. and 631.421:519.24
 COCHRAN, W. G.
The analysis of groups of experiments.
 J. Agric. Sci. 1938 : 28 : 556-80.
 When a set of experiments involving the same or similar treatments is carried out at a number of places, or in a number of years, the problem arises of examining comprehensively all the results. It is not possible to lay down rules of procedure that will be applicable in all cases, but there are certain preliminary steps in the analysis which can be dealt with in general terms. These are discussed and illustrated by means of examples. Possible modifications of the ordinary analysis of variance procedure are referred to, brought about by lack of equality in the errors of different experiments, or non-homogeneity of certain components of interaction. J. W.

26. BARTLETT, M. S. 631.421:633.51
The approximate recovery of information from replicated field experiments with large blocks.
 J. Agric. Sci. 1938 : 28 : 418-27.
 The method suggested by Papadakis of using covariance with the yield of neighbouring plots to reduce the error in replicated field experiments is critically examined and illustrated by two large-scale cotton experiments. It is concluded that the method may be useful in certain instances, where the number of plots per block is large and the blocks themselves are variable, and should be approximately valid. Some convenient method of reducing the block size such as confounding or its analogues, should, however, be used wherever possible, since the statistical analysis involved is much simpler.

27. TANG, Y. 631.421:633.63.0014
Certain statistical problems arising in plant breeding.
 Biometrika 1938 : 30 : 29-56.

The author considers the general problem of plant breeding in its two aspects: (1) the production of new families or varieties which may prove to be better than the established standards, and (2) testing whether any of these new varieties exceed in quality the established standards. The second of these steps involves field trials in which the new varieties are compared with a standard. A question studied is whether it is more important to have more new varieties and test them superficially or fewer varieties and test them with great accuracy. The problem is illustrated on sugar beet, in the production of varieties with greater sugar content than hitherto. The true excess in sugar content is not known, and has to be estimated from the data, and a method of estimating the distribution of the true excesses over the standard is described. It is shown that a knowledge of the power function of the excess is essential to a solution of the problem, and a method of estimating this function from the results of previous experiments is worked out, and applied to actual experimental data. General conclusions are drawn as to the number of replications to be used, and the method of procedure to be followed if the accuracy of the field experiments proves to be poor.

J. W.

28. GILBERT, S. M. 631.421:633.73
Variability in yield of *Coffea arabica*.
 E. Afr. Agric. J. 1938 : 4 : 131-39.

The individual tree yields of a block of about 500 trees for the four years 1934-1937 inclusive were studied. Biennial bearing was very pronounced and the variability was so great that when a Latin Square arrangement was superimposed on the results, very large differences for significance were required. Some improvement in precision could be obtained by combining all four years. The application of the covariance method resulted in a very considerable gain in precision.

AGRICULTURAL OPERATIONS 631.5

29. 631.531.12:581.162.31(71.3)
Regulations governing the production of registered seed of self-fertilizing grain crops.

Circ. Canad. Seed Gr. Ass. 1938 : No. 6 : Pp. 15.

An account of the standards which must be attained before a seed crop is eligible for official registration by the Canadian Seed Growers Association, together with general regulations governing inspection, threshing, cleaning, etc.

30.

631.557-1.421

Crop estimation and its relation to agricultural meteorology.
 (A discussion before the Industrial and Agricultural Research
 Section of the Royal Statistical Society, November 18th, 1937,
 Mr. H. D. Vigor in the Chair).

Suppl. J.R. Statist. Soc. 1938 : 5 : 1-45.

The plant breeder is only indirectly concerned with the effect of weather on crop yield. Nevertheless, his attention might quite profitably be directed to this discussion of the methods which have been used to obtain data of crop yield of an accuracy comparable to that attained in the collection of meteorological data. The problem involves points relating to multiple experiments at different places and in different seasons, and also includes discussion of the best methods of sampling field plots for observational and yield determinations. There are statistical problems in relation to the lay-out and the sampling technique, which are dealt with in the discussion.

J. W.

ECONOMIC PLANTS 633

31.

CALDER, R. A.

633:575:578.08:581.6

Report on visit to Europe and Canada, April-October, 1937.

Pl. Res. Bur., Dep. Sci. Industr. Res. Wellington, N.Z. 1937 : Pp. 142.
 (Mimeographed).

A detailed report of the methods in the breeding of certain crops in Canada, Great Britain, Sweden, Denmark, Holland and, in the case of lucerne, New Zealand. The crops dealt with are lucerne, *Brassicaceae*, potatoes, peas, oats, barley, flax and onions. In each case an account is given of the actual work in hand at each of the stations visited. Certain technological problems, such as lucerne drying and pea canning are also dealt with.

32.

McTAGGART, A.

633-1.524:575(94)

Some principles affecting the introduction of plants.

J. Aust. Inst. Agric. Sci. 1938 : 4 : 82-84.

The views of Vavilov on the centres of origin of cultivated plants are briefly stated and their application to the introduction of plants, especially those of use in plant breeding, in Australia is discussed.

WHEAT 633.11

33.

CRAIG, J. I.

633.11:575

Wheat breeding. Maintaining form and selecting new types.

Milling 1938 : 90 : 70-72.

A simple and lucid exposition of the principles of line breeding and of the use of hybridization to create new wheat varieties with desired recombinations of characters.

34.

KADAM, B. S. and

633.11:575(54)

KULKARNI, R. K.

633.11 Bansipalli-808

Genetic improvement of wheat in Bombay.

I. Bansipalli-808.

Agric. Live-Stk. India 1938 : 8 : 376-87.

This is a description of a new durum wheat, Bansipalli-808, derived from a cross between Bansi-168 and Kala-Khapli-568. It has proved to be suited to large areas of the province of Bombay, where it gives considerably increased yield and a larger, more attractive grain. It is from 10 to 15 days earlier than the local wheat, and thus often escapes rust, though it is rust-susceptible. It is slightly more difficult to thresh and is more liable to frost injury than the local wheat. Its grain is not so hard as the local wheat of Karnatak, and for that reason the new variety is not considered satisfactory in that region.

35. KOSTOFF, D. 633.11:575.127.2:576.356.2
Transgressive segregation in structural hybrids.
Curr. Sci. 1938 : 7 : 60-62.

A *turgidum*-like derivative from the cross *Triticum vulgare* x (*T. turgidum* x *T. dicoccum*) and a *persicum*-like derivative from the cross (*T. vulgare* x *T. monococcum*) x *T. persicum* when crossed produced an F_1 which at meiosis showed signs of structural hybridity and in F_2 showed wide, transgressive segregation in respect of several characters. This wide segregation the author attributes to the structural hybridity of the F_1 . A cross between *T. turgidum* and *T. persicum* showed transgressive segregation only in respect of time of flowering and in F_1 had regular meiosis. Other examples of wheat hybrids in which wide segregation may be attributed to structural hybridity are mentioned and the importance of the phenomenon in plant breeding and in evolution is indicated.

36. 633.11-2.452-1.521.6:575(54.5)
 PAL, B. P. 633.11:575.127.2
Report of the wheat breeding section of the scheme for investigations on cereal rusts for 1936-37.
New Delhi 1937 : Pp. 3.

The F_2 populations of eight crosses were tested for rust resistance by artificial inoculation in the greenhouse with a mixture of physiologic races of black, brown or yellow rusts. The results are tabulated. Selections were made for growing on to F_3 , when further tests for resistance will be made. It is hoped to produce desirable rust-resistant varieties for cultivation throughout the North Indian plain and in parts of Peninsular India.

Hybrids between Khapli emmer and *T. vulgare* varieties were made, but all the plants obtained either died in the seedling stage or produced entirely sterile ears. *T. Timopheevii* x *T. vulgare* crosses gave seeds which failed to germinate. *T. Vavilovianum* x *T. vulgare* gave very vigorous hybrids, as also did Khapli emmer when crossed with *T. durum* and *T. persicum*. Certain new varietal crosses were made, and the study of a collection of Indian and foreign wheats continued.

OATS 633.13

37. ELLISON, W. 633.13:576.356.2:575.12
The occurrence of quadrivalents in certain diploid and tetraploid *Avena* hybrids.
J. Genet. 1938 : 36 : 515-22.

A ring of four chromosomes was observed at meiosis in the following hybrids: Cc1795 (an unclassified diploid oat) x *A. Wiestii* ($n = 7$); *A. barbata* ($n = 14$) x *A. Abyssinica* ($n = 14$); and in a hybrid between two segregates of the cross Cc1795 x *A. brevis* ($n = 7$). In each case the two longest chromosomes from each parent appeared to be involved. The ring was orientated disjunctionally in about two-thirds of the metaphase plates.

It is concluded that a simple reciprocal interchange is responsible for the configuration. No ring of four was observed in the cross *A. brevis* x *A. strigosa*.

38. PHILP, J. 633.13:576.356.4:576.356.2:581.45
Aberrant leaf width in polyploid oats.
J. Genet. 1938 : 36 : 405-29.

In segregates of a cross between *Avena sativa gigantica* and *A. fatua*, certain plants which segregated in the ratio one broad-leaved: two narrow-leaved were found. These proved to be 41 chromosome plants, in which only one dominant gene for broad leaves occurred, and that in the unpaired chromosome. Loss of the univalent due to lagging at meiosis gave the excess of narrow-leaved plants in the progeny. The odd chromosome was included in the pollen nucleus only in about 6 per cent of cases.

A plant was also found containing one normal V chromosome and a fragment, the fragment not containing the gene for normal chlorophyll production. This plant segregated the expected number of albinos.

A chromatin bridge, indicating an inverted chromosome segment, was found in some cells.

MILLETS AND SORGHUMS 633.17

39. VIJAYARAGHAVAN, C. and
 SESHADRI SARMA, P. 633.171-1.557:575.242
R. 42—An economic recessive mutant from E.C.593 ragi (*Eleusine coracana* Gaertn.).
 Curr. Sci. 1938 : 6 : 611-12.

R.42, a plant with "in-curved" ears arose as a result of mutation in E.C.593, a strain with "top-curved" ears. The character "in-curved" ears behaves as a simple recessive to "top-curved" and R.42 has bred true since its first discovery. An interesting feature of the mutant strain is that in three seasons' tests with other varieties of ragi it was the heaviest yielder, giving 9 to 10 per cent more grain than E.C.593. As its type of head is more favoured by cultivators than that of E.C.593, it is hoped that it will be a more popular variety than the latter.

40. RANGASWAMI AYYANGAR, G. N.,
 PONNAIYA, B. W. X. and
 VENKATARAMANA REDDY, T. 633.174:575.11.061.6
Sorghum—purple pigment in the late-seedling stage.
 Curr. Sci. 1938 : 6 : 612-13.

In certain African varieties the third to the eighth or tenth seedling leaves carry a purple (anthocyanin) pigment. This type of pigmentation is independent of the colouring of the coleoptile or the emerging glume and is due to a simple dominant P_{LS} . The recessive seedlings remain green at the corresponding stage.

41. RANGASWAMI AYYANGAR, G. N. and
 SANKARA AYYAR, M. A. 633.174:575.116.1:581.46
Linkage between a panicle factor and the pearly-chalky mesocarp factor (Zz) in sorghum.
 Proc. Indian Acad. Sci. 1938 : 8 : Sect. B : 100-07.

In *Sorghum dochna* two panicle types exist—panicles with long, rather spreading branches which give a loose type of ear, and panicles with short branches adpressed to the main rachis, making the ear compact and spindle shaped. A single gene pair, Pa_1pa_1 , determines the differences between these two types. This locus is linked to the factor pair for pearly v. chalky mesocarp (Zz) with 1·07 per cent of crossing over.

42. RANGASWAMI AYYANGAR, G. N. and
 KUNHIKORAN NAMBIAR, A. 633.174:575.116.1.061.6:581.45
The coupling phase of the linkage relationship between "leaf-sheath-glume" and "dry anther-grain" colours in sorghum.
 Curr. Sci. 1938 : 7 : 17-19.

The factors for reddish purple (Q) v. blackish purple leaf-sheath (q) and presence (B) v. absence (b) of brown colour in the dry anthers and grain are absolutely linked. Asiatic sorghums are predominantly $QQbb$, and African forms $qqBB$, but forms also occur in which the two factors are in the coupling phase. Reddish-purple varieties give more palatable fodder than those with blackish-purple leaf sheaths, but the brown grain usually associated with the latter is an advantage in rainy harvests, as it does not turn mouldy easily. Therefore the double dominant forms are economically desirable in regions where the harvest weather may be rainy.

RICE 633.18

43. NANDI, H. K. 633.18:576.356.5:575.127.2
Interspecific hybridization in *Oryza* I. Cytogenetical evidence of the hybrid origin of *Oryza minuta* Presl.
 Trans. Bose Res. Inst. 1938 : 11 : 99-121.

Morphological evidence suggested that *Oryza minuta* is an allopolyploid species derived from *O. officinalis* and *O. sativa*. Cytogenetical data are now forthcoming to confirm this.

O. officinalis ($2n = 24$) has larger chromosomes than *O. sativa*. *O. minuta* has two sets of 24 somatic chromosomes, one set slightly larger than the other. The difference in size corresponds to the difference between the chromosomes of the two supposed parent species. The F_1 hybrid of *O. sativa* \times *O. officinalis* shows complete lack of synapsis, 24 univalents being found. The hybrids *O. minuta* \times *O. officinalis* and *O. minuta* \times *O. sativa* each show 12 bivalents and 12 univalents. In the former case, the 12 univalents are the smaller set, and in the latter case they are the larger set, of *O. minuta*. This is held to indicate that larger and smaller sets of 12 chromosomes in *O. minuta* are truly homologous with the chromosome sets of *O. officinalis* and *O. sativa* respectively, and therefore that *O. minuta* is an allopolyploid involving these two species.

The author records the occurrence of secondary pairing in *O. minuta*, the maximum association being twelve groups of two bivalents each.

ROOTS AND TUBERS 633.4

44. DAVIDSON, W. D. 633.491(41.5)
Potato growing for seed purposes.
 Published by Stationery Office, Dublin. Pp. 236.
 A section on the identification of varieties is included, giving descriptions of numerous varieties.
45. SALAMAN, R. N. 633.491(8)
The origin of the potato and its influence on man's early settlement in South America.
 Proc. Roy. Inst. 1938 : 30 : Pp. 26.
 SALAMAN, R. N.
A short sketch of the history of the potato.
 Sci. Wkr. 1938 : 10 : 2-5.
 The substance of these papers is contained in the article reviewed in "Plant Breeding Abstracts", Vol. VIII, Abst. 33.
46. PAL, B. P. 633.491:575.127.2(54)
Problems of potato breeding in India.
 Agric. Live-Stk. India 1938 : 8 : 388-96.
 The present position of potato breeding in Europe and America is briefly reviewed, and the special problems met with in India are discussed. The potato diseases encountered in India present much the same problems as elsewhere; it is hoped to produce resistant forms by crossing standard varieties with resistant species collected from South America. Special problems peculiar to India which may be soluble by means of similar interspecific hybridization (a) the production of varieties with tubers which do not rot when stored at high temperatures in the Indian summer, (b) the breeding of forms in which the tubers do not require a period of dormancy before being replanted, so that the growing of several crops in one year is facilitated, and (c) the production of short-day forms, which would be better suited to growing in the Indian winter than the long-day forms at present cultivated.
 A collection has been made of South American species of *Solanum*, and some of their hybrids, and a potato breeding station established at Simla, where tests have shown that potatoes flower and fruit freely.
 The technique adopted in raising plants from seed is described. It is probable that the method adopted for much of the breeding work will be crossing of established varieties of *S. tuberosum* with other species, followed by repeated back-crossing to the *S. tuberosum* parent.
47. 633.491-2.411.4-1.521.6:575(54.5)
 633.491:575.127.2
Progress Report of the Potato Breeding Scheme for Northern India for the year 1936-37.
 New Delhi 1937 : Pp. 8.
 A list is given of the interspecific crosses made at Simla in 1936, with the amount of success attained in each. Artificial inoculation of the material with spores of *Phytophthora infestans* was not possible, but observations of resistance were made during a severe natural epidemic.

Three interspecific hybrids, *S. demissum* x *S. tuberosum*, the direct hybrid *S. Antipoviczii* x *S. tuberosum* and its back-cross to *S. tuberosum*, showed a very high degree of resistance, but gave low yields and had undesirable tuber characters.

Six of 125 varieties of *S. tuberosum* collected in South America showed a high degree of resistance. *S. demissum*, *S. Antipoviczii* and *S. neountipoviczii* were immune to the disease, and certain other species showed resistance.

FIBRES 633.5

48.

633.51:575

Report of the Administrative Council of the Corporation submitted to the Seventeenth Annual General Meeting on May 25, 1938.

Rep. Emp. Cott. Gr. Corp. (1936-1937) 1938 : Pp. 60.

The report contains a brief account of the research work of the Genetics Department of the Cotton Research Station, Trinidad.

Crosses between wild and cultivated cotton species are being studied in relation to the species problem. A third linkage has been discovered in Asiatic cottons. The type collection of New World cottons has been sorted and reclassified. Experiments have been started on the inheritance of quantitative characters and a large experiment has been laid out to compare the variability of interspecific and intervarietal crosses.

Mention is also made of studies on pollen tube growth at King's College, London, and of vernalization at the Imperial College of Science and Technology.

49.

HUTCHINSON, J. B.

633.51:575

Some problems in genetics, whose solution would help the plant breeders.

Emp. Cott. Gr. Rev. 1938 : 15 : 286-89.

Some seven problems of direct interest to the plant breeder, in particular to the cotton breeder, and requiring genetical investigation are listed for discussion.

50.

633.51:575(67.61)

Serere Experiment Station.

E. Afr. Agric. J. 1938 : 4 : 116-20.

The early history of the station, first opened in 1919-20, and the work on cotton breeding are briefly described.

The cotton breeding work is carried on along three lines; first, single plant and mass selection from established varieties; second, single plant selection from newly introduced varieties, the most successful of these being U.4.4.2; third, the production of new varieties by hybridization, the chief aim being to combine the good lint characters of the Nyasaland Upland types (N.17 and S.G.29) which are derived from the American Upland variety Floradora, with the high yield and desirable agricultural characteristics of the U.4.4.2 derivatives. The principle adopted has been to concentrate primarily on the selection of agriculturally suitable types with high yield, upright sympodial habit, early maturity, drought resistance, high ginning percentage, tolerance of black arm disease and jassid attack and a minimum lint length of 29 to 30 mm. Having obtained a cotton fulfilling these conditions the next step is to improve lint characters. This procedure is considered easier than selecting first for lint characters and then attempting to improve the agricultural qualities.

An outstanding cotton produced by these methods is S.P.84, which is a high yielder with lint little, if any, inferior to the standard Uganda cotton and with much higher resistance to blackarm.

The work on food crops is mentioned (Cf. Abst. 5).

51.

GADDUM, E. W.

633.51:575(68.2)

Cotton research at Barberton.

E. Afr. Agric. J. 1938 : 4 : 5-12.

A description of the technique used in cotton breeding at the Barberton Experimental Station, Transvaal and of other research work on cotton being conducted there.

52. PEAT, J. E. and PRENTICE, A. N. 633.51:575(68.9)
Comments on Dr. Mason's note on the technique of cotton breeding.
 Emp. Cott. Gr. Rev. 1938 : 15 : 301-05.

The authors question the validity of Mason's emphasis on the value of primary selections (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 1042) and instance the work done at Gatooma, Southern Rhodesia on the improvement of U.4 as an example of the value of re-selection.

53. HUTCHINSON, J. B. and NATH, B. 633.51:575.061.6
A note on the occurrence of chlorophyll deficiency in *Gossypium arboreum*.
 Indian J. Agric. Sci. 1938 : 8 : 425-27.

A chlorophyll-deficient seedling type which appeared in a cross between two varieties of *G. arboreum* proved to be a simple Mendelian recessive to normal green. B.P.P.

54. JAMESON, J. D. 633.51:575.42(67.61)
Plant selection in native cotton plots.
 Emp. Cott. Gr. Rev. 1938 : 15 : 295-300.

After stressing the advantage of selecting from the native cotton crops the author describes his procedure in reselecting N.17 (a selection from Nyasaland Upland), which though still the best commercial variety in Uganda has suffered some admixture since its release. Six types occurring in the crops are recognized and it is believed that their characteristics are more or less constant. One of these shows good all-round qualities and it was on selections from this type that attention was concentrated. No single attribute was given undue stress in selecting. The progenies of the selections are tested in progeny rows and later in variety tests. It is intended ultimately to combine progenies to form a mass selection.

55. HUTCHINSON, J. B. 633.51:576.16
The distribution of *Gossypium* and the evolution of the commercial cottons.
 Indian Cent. Cott. Comm., 1st Conf. Sci. Res. Wkrs Cott. India, Bombay (1937) 1938 : 347-68.

The geographical distribution and relationships of the species of *Gossypium* are discussed. It is shown that all cultivated species have undergone development in the same direction. Early, annual, sympodial forms have been developed from perennial, monopodial, bushy forms, enabling cultivation to spread into regions with a short growing season and cold winters, and also making cultivation and pest control easier.

Evidence is given to show that the 26 chromosome New World cottons arose from hybridization between 13 chromosome cottons of the New World and of Asia, the line of meeting being across the Pacific in pre-Columbian times.

56. HUTCHINSON, J. B. 633.51-1.524.2(6)
Note on a policy of introduction of new varieties of cotton in Africa.
 Emp. Cott. Gr. Rev. 1938 : 15 : 283-85.

After discussing the value of introductions and their use in hybridization, the author suggests exchange of information on introductions already made and gives a list of questions to be answered by cotton breeders, the replies to which he is prepared to summarize and publish.

57. BLACK, A. G. 633.51:677.1:575(73)
Progress in improving the quality of American cotton.
 Cotton Manchr. 1936 : 42 : No. 2035 : 17-18.

Considerable improvement is being effected in the quality of the United States cotton crop by improved ginning technique, by artificial drying at the time of ginning, and by various other means.

The development and wider use of new varieties of better staple length and general quality has been very important in this connexion.

For a long time it was considered that the superior strength of yarns spun from Sea Island cotton was due to its extra long staple. It has now been demonstrated that the most important factor is not length, but fineness of the fibre. Selections are now being made within varieties of the Upland group for increased fineness, and hybrids are being developed between the Upland and Sea Island groups. The fibres of the Hopi cotton, a commercially worthless variety grown by the Hopi Indians, are exceptionally fine, and may be spun into strong yarn in spite of their short length. Crosses have been made by the Department of Agriculture between the Hopi and Acala varieties, and some of the strains developed from this cross have fibre of exceptional spinning quality.

58. DESHPANDE, R. B. 633.524.35:575.11
Studies in Indian fibre plants. No. 5. Further studies on the inheritance of certain characters in *Hibiscus sabdariffa*.
 Indian J. Agric. Sci. 1938 : 8 : 229-43.

In crosses between the varieties *altissima*, *ruber* and *albus* of *H. sabdariffa*, the factor *R* is responsible for the expression of red stem colour. Three factors, *A*, *B* and *W*, together produce the red patch below the petiole while *M* and *S* are responsible respectively for brown and scarlet stem flush. Another factor *X* produces a red patch in the leaf-axil. The factors *M* and *S* are absent in *altissima* and *R* is absent in *albus*; the other factors are common to the three varieties.

Pink colour in the faded corolla depends upon a factor *F* which finds expression only when *R* is present. Narrow leaf-lobe and hairy stem are dominant to broad leaf-lobe and non-hairy stem giving 3 : 1 and 15 : 1 ratios respectively in F_2 . B. P. P.

SUGAR PLANTS 633.6

59. JANAKI AMMAL, E. K. 633.61:575.127.5:633.15
A *Saccharum*-*Zea* cross.
 Nature, Lond. 1938 : 142 : 618-19.

A single hybrid seedling has been obtained by pollinating many thousands of flowers of the *S. officinarum* var. Vellai with the maize var. Golden Beauty. The hybrid is dwarf in habit and though it tillers freely it has not flowered during its first 22 months. The maize parent had two *B* or inert chromosomes and the hybrid has these also, thus having 52 chromosomes, 40 from the sugar cane and 10 + 2 from the maize parent.

60. DUTT, N. L., KRISHNASWAMI, M. K. and SUBBA RAO, K. S. 633.61-1.547.1:581.162.5
A note on seed-setting and seed-germination in certain sugarcanes.
 Indian J. Agric. Sci. 1938 : 8 : 429-39.

Certain varieties, e.g. P.O.J.2725, gave uniformly high germination of seeds while certain other varieties gave consistently low germination. Seeds of varieties of *S. spontaneum* usually germinated very satisfactorily. The high or low germinations seemed to depend on the inherent capacity of the female parent though the influence of the pollinating parent was also visible to a certain extent. It is pointed out that the most suitable varieties for pollinating each variety used as female can be determined only by experimentation.

Seed-setting and seed-germination were better in sessile than in pedicelled spikelets. A high positive correlation was found between the thickness of the cane and the length and width of the seed.

Endeavours to improve seed-germination by chemical treatments were not successful.

B. P. P.

STIMULANTS 633.7

61. KOSTOFF, D. 633.71:575.129:576.312.31
Differentiation of heterochromatic regions during meiosis.
 Nature, Lond. 1938 : 142 : 577-78.
 A note recording the appearance of heterochromatin in the neighbourhood of the centromere in bivalents at first metaphase in the amphidiploid *Nicotiana glanca* x *N. Langsdorffii*.
62. KOSTOFF, D. 633.71:581.481:575.125
The size of *Nicotiana rustica* x *Nicotiana Tabacum* hybrid embryos and hybrids in respect to their parents.
 Curr. Sci. 1938 : 6 : 326-27, also C.R. (Doklady) Acad. Sci. U.R.S.S. 1937 : 17 : 427-29.
 The author has noted that in some *Nicotiana* species crosses the hybrid embryos are much smaller than the embryo of the parental species and yet give very vigorous plants, in contradiction of Ashby's hypothesis of hybrid vigour as due merely to increased "capital" in the embryo.
 The following figures are given for the cross *N. rustica* x *N. Tabacum*: average length and breadth of embryo, *N. rustica* selfed 998.5 and 764.3, *N. Tabacum* selfed 684.2 and 503.7, F₁ 181.7 and 126.3, amphidiploid 936.3 and 718.2. Height of mature plants in cms: *N. rustica* 82.8, *N. Tabacum* 96.2, F₁ 148.5, amphidiploid 128.9.
63. CARPENTER, P. H. 633.72:575
The application of science to modern tea culture.
 Mem. Tocklai Exp. Sta. (Indian Tea Ass.), 1938 : No. 4 : Pp. 13.
 A brief account is included of selection work with tea.
64. 633.72:575(54)
Proceedings of the 1st Annual Conference held at Tocklai on the 18th, 19th and 20th February, 1937.
 Tocklai Exp. Sta. Indian Tea Ass. 1937 : Pp. 70.
 One of the topics discussed at the conference was the problem of "jat," in connexion with which the possibilities of improvement in quality and uniformity were raised.
65. 633.72:575(54)
Proceedings of the 2nd Annual Conference held at Tocklai on the 17th, 18th and 19th February, 1938.
 Tocklai Exp. Sta. Indian Tea Ass. 1938 : Pp. 107.
 The improvement of uniformity and quality of tea by selection methods was discussed. Differences between individuals in quality have been established and associations between quality and certain characters have been noted. The next step is the study of vegetative propagation with a view to establishing clones from selected bushes.
 The use of floral characters for classification was also mentioned.
66. 633.72:575(54.8)
Twelfth annual report of the Board of the Tea Research Institute of Ceylon for 1937.
 Bull. Tea Res. Inst. Ceylon 1937 : No. 18 : Pp. 94.
 In the section dealing with the selection of high-yielding bushes data are given showing the wide variation in yield and the prevalence of low-yielding bushes among 1,515 bushes at Galatura. The best yielders are being propagated for further test.
 It is suggested that estates should carry out progeny tests with their seed-bearers, with a view to discarding those producing undesirable seedlings.
67. TUBBS, F. R. 633.72:575.42
Replanting—II. Tea selection.
 Tea Quart. 1938 : 11 : 54-68.
 In a lecture given to an association of planters, the great variability of tea plants in commercial fields in Ceylon is stressed. It is suggested that the planters themselves should

consider the desirability of establishing nurseries for the selection of material for replanting. The suggested procedure is (1) selection of seed-bearing bushes, (2) testing selections by clonal propagation or by progeny tests and (3) elimination of the less vigorous plants in the seedling progeny. The discussion which followed the lecture is printed in full.

68. 633.73(67.62)
633.73-2-1.521.6

Annual Report of the Board for the year ended 30th June, 1938.
Coffee Bd. Kenya, 1938 : Pp. 68.

A report of the organization and activities of the Board for the year 1937-38. The condition of the world's coffee markets is briefly reviewed, and the steps taken to lower the cost of marketing Kenya coffee and to increase the demand for it, are outlined.

Brief mention is made of the selection and breeding work being conducted by the Board. Outstanding trees in as many plantations as possible are marked, and their individual yields are noted over a number of years by native recorders. Observations on disease resistance are also made. The best trees will be propagated vegetatively for further study. The Blue Mountain and Padang varieties are highly resistant to coffee-berry disease. Plots of these varieties are being recorded to see whether they contain trees with satisfactory yield. Certain types of coffee have been found to be resistant to "Elgon Die-back" when grown without shade. Shading, however, controls the disease in all varieties.

69. 633.73:575(67.8)

Fourth Annual Report of the Coffee Research and Experimental Station, Lyamungu, Moshi 1937.

Pamphl. Dep. Agric. Tanganyika 1938 : No. 22 : Pp. 55.

The work of recording tree yields, with a view to mass clonal propagation of the best selections, is being continued. The criteria used for making selections are: suitability of the tree to the district where its cuttings are to be grown; vigour and freedom from disease; average yield over a 5-year period of $1\frac{1}{2}$ kg. or more of parchment coffee, with as little variation from year to year as possible; output of clean marketable coffee and minimum mean bean weight of 0.150 grm. (sample from all pickings).

70. VENKATARAYAN, S. V. 633.73:581.145.2:581.163

Coffee black bean.

Curr. Sci. 1938 : 7 : 113-14.

Coffee black bean is a result of the degeneration of the endosperm following failure to produce an embryo. It is suggested that its occurrence may be caused by failure of fertilization, due perhaps to pollination with incompatible pollen. Such pollen may stimulate the production of fruits parthenocarpically.

71. FLEMING, C. W.,
BARNARDO, W. S. E.,
FAHEY, H. and
LOVELL, J. S. 633.74:575(72.98)

Visit to "Arden Estate" Tobago.

Report of delegates of the Agricultural Society sent to "Arden Estate", March, 1938.

Proc. Agric. Soc. Trin. Tob. 1938 : 38 : 199-201.

The owner of the estate, Colonel le Hinds-Howell, claims to have established six strains of Criollo cacao each with a different characteristic.

O. Hardy and bears well. 2. Only planted on best soil (Silver-grey). 7. Largest bean, plump, longest pod. Heavy bearer. 8. Like O but no bottle-neck. 48. Very small neck. Large round middle. N. Never forks. Grows no chupons. Only palmas. Only rooted chupons are being budded on this estate.

72. VOELCKER, O. J. 633.74:581.162.32
The incidence of cross-pollination in cacao.
 7th Annu. Rep. Cacao Res. Trinidad (1937) 1938 : 9-14.
 Genetic evidence is presented to show that in Trinidad as many as 50 per cent of pods of self-compatible cacao trees may be cross-fertilized. In the case of self-incompatible trees, a higher percentage of out-crossing was proved, but the method used did not allow of conclusive proof that all the pods were the result of cross-fertilization.
73. VOELCKER, O. J. and COPE, F. W. 633.74:581.162.5:631.557
Some factors controlling the yield of young cacao.—I.
 7th Annu. Rep. Cacao Res. Trinidad (1937) 1938 : 14-18.
 A preliminary report of an experiment to show the effect of compatibility on yield in Trinidad cacao, together with the effect of various fertilizer and cultivation treatments. Self-compatible and self-incompatible trees both produce the same number of flowers, but the number of cherelles set (at six weeks old) by self-compatible trees averages about four times as high. The cherelles set by self-compatible trees show a rather higher percentage of loss due to cherelle wilt, but the difference only very slightly offsets the above advantage in bearing.
74. POSNETTE, A. F. 633.74:581.162.52
Student investigation 1936 37. Incompatibility and pollination in cacao. Summary of dissertation submitted.
 7th Annu. Rep. Cacao Res. Trinidad (1937) 1938 : 19-20.
 Evidence suggests that in incompatible cacao pollination the pollen tubes may be unable to reach the ovary. Pollination in the bud stage or at the base of the style did not lead to seed setting in incompatible combinations. Pollen from *Theobroma augustifolia* stimulates initial pistil development of self-compatible *Th. cacao*, but gives no seed. The pollen grains of *Th. bicolor* did not germinate on *Th. cacao* stigmas. It is concluded that the most likely pollinating agents of cacao in Trinidad from February and May are nocturnal ants, helped by smaller ants, and by Drosophilids in rainy weather.
75. VOELCKER, O. J. 633.74:581.162.52
Self-incompatibility in cacao—II.
 7th Annu. Rep. Cacao Res. Trinidad (1937) 1938 : 2-5.
 Cacao trees in Trinidad fall into two groups, self-compatible and self-incompatible. The grouping of a particular tree is permanent, and is not affected by seasonal influences. Self-compatible trees set fruit with pollen from either self-compatible or self-incompatible trees. Self-incompatible trees set fruit when pollinated with self-compatible pollen, but as far as the experiments go, pollen from other self-incompatible trees is ineffective. If this proves to be generally true, it is obvious that the presence of self-compatible trees in a plantation in sufficient number is of the utmost importance, since they must supply pollen for the whole plantation. In Trinidad a heavy flowering period occurs in May or June, but practically none of the flowers produced then set seed. Artificial pollination at this period shows that the flowers are capable of setting seed normally, and the failure to do so in nature is attributed to the absence of the requisite pollinating agent. It is suggested that the lower yields of cacao in Trinidad, as compared with Nigeria, may be due to the presence of self-incompatible trees, which do not occur in the latter country.
76. VOELCKER, O. J. 633.74:581.162.52
A note on the behaviour of cacao flowers after pollination and on the incidence of cherelle wilt.
 7th Annu. Rep. Cacao Res. Trinidad (1937) 1938 : 5-8.
 It is shown that self-pollination of self-incompatible trees may lead to stimulation of the pistil, giving an apparent "set" of seed. This phenomenon is subject to seasonal variation,

and is probably the reason for Pound's conclusion, now shown to be wrong, that self-incompatible trees may become self-compatible, or vice versa.
 Similar stimulation of initial pistil growth is caused by the witchbroom fungus, *Marasmius perniciosus*. Such fruits are all shed by the fourteenth day after pollination, so that this is regarded as the correct time to make counts of percentage "set".
 Data are presented showing the frequency of wilted cherelles at various periods after pollination.

- | | |
|--|---|
| <p>77.</p> | <p>633.74-2.483-1.521.6(86)
633.74:576.16</p> |
| <p>Cacao and witchbroom disease (<i>Marasmius perniciosus</i>) of South America with notes on other species of <i>Theobroma</i>.
 Report by Dr. F. J. Pound on a visit to Ecuador, The Amazon Valley and Colombia. April 1937-April 1938.
 Dep. Agric., Trinidad and Tobago 1938 : Pp. 59.</p> | |
| <p>Cacao trees relatively resistant to witchbroom disease have been found in Ecuador. Their seedling progenies form promising material for the ultimate selection of highly resistant or immune types which are high-yielding. Certain wild species and varieties of <i>Theobroma</i> found in the Amazon basin appear completely immune. These have been introduced into Trinidad for use in crossing experiments.</p> | |
| <p>78.</p> | <p>633.74.00.15
633.74:575</p> |
| <p>CHEESMAN, E. E.
 Recent botanical researches in cacao.
 Emp. J. Exp. Agric. 1938 : 6 : 219-24.</p> | |
| <p>The topics covered in this brief survey are the material for research, selection, propagation and self-incompatibility.</p> | |
| <p>79.</p> | <p>633.79:575(42)
633.79 Bullion Hop (Q.43)
633.79 Brewer's Gold (C.9a)</p> |
| <p>SALMON, E. S.
 Notes on hops.
 J. S-E. Agric. Coll. Wye 1938 : No. 42 : 47-59.</p> | |
| <p>An account is given of the botanical and general characters of Bullion Hop (Q.43) with information on its preservative value and on its brewing characteristics. This variety is derived from the wild hop of Canada (<i>Humulus americanus</i>), the pollen parent being an unknown English hop. It is a symptomless mosaic-carrier.</p> | |
| <p>A botanical description is given of Brewer's Gold (C.9a) with further notes on its yield, preservative value, aroma and behaviour in brewing trials. This and the preceding variety are suitable for replacing American hops in brewing, but the policy of the Hops Marketing Board does not encourage the planting of high preservative value hops in England.</p> | |
| <p>80.</p> | <p>633.79.00.14(42)</p> |
| <p>SALMON, E. S.
 Twenty-first report on the trial of new varieties of hops.
 J. Inst. Brew. 1938 : 44 : 457-64.</p> | |
| <p>Data on yields and preservation quality of 233 new hop varieties grown at the East Malling Research Station are given. Since these measurements are based on single, unreplicated, small plots of each variety in a heterogeneous field, no estimate of their error is possible and therefore much of the work is of doubtful value.</p> | |
| <p>At present, American hops are imported into England on a large scale, as they have higher preservative qualities than any grown commercially in this country. Five of the new varieties under test were richer in preservative qualities than the richest American sample obtainable, and also had good flavour in brewing tests. There seems to be no reason why such varieties should not be grown in this country to replace the imported American hops.</p> | |
| <p>The incidence of mosaic disease and downy mildew is recorded.</p> | |

RUBBER PLANTS 633.91

81.

633.912:575(91)

Annual Report. Botanical Division. III. Selection and breeding.

Rep. Rubb. Res. Inst. Malaya (1937) 1938 : 108-17.

Yield data are given for a number of new clones derived from high-yielding mother trees on estates. The yields of some of these clones are comparable, in the first year of tapping, with those of the best proved clones under observation.

Details are given of new crosses made in 1937, and also of the yields of seedling families obtained from crosses made between 1928 and 1931. A number of exceptionally high-yielding seedlings were found. Yield data are also presented for clones obtained from some of the early seedlings, and for certain other material. Variation in yield is high throughout.

A method of test tapping at an early age, described in earlier reports, was found to give results very significantly correlated with the actual yield in the third tapping year. The correlation was rather less than in the first and second tapping years, however, owing perhaps to a change of tapping height.

82.

633.912:575(91)

Prang Besar clones.

Bull. Rubb. Gr. Ass. 1938 : 20 : p. 296.

The results of tests of some new Prang Besar rubber clones are briefly reported. Families raised from controlled crosses between 1928 and 1930 have given promising results and some very high-yielding clones have been isolated from them.

FRUIT TREES 634

83.

634.13:575(42)

SPINKS, G. T.

634.13 Bristol Cross

Pear breeding investigations.

Annu. Rep. Agric. Hort. Res. Sta. Bristol 1937 : 15-30.

Observations and data are given on fruit and tree characters, season of blossom and fruit and susceptibility to disease of seedling pears from crosses of Conference as male parent with Doyenné du Comice, Durondeau, Dr Jules Guyot, Louise Bonne of Jersey and Williams' Bon Chrétien. No sharp segregation was noted, variation being usually continuous within each family and usually transgressing the parental values.

Selections combining quality, yield and disease resistance have been made, each family having contributed some and the total number being 16. One, derived from Williams' Bon Chrétien x Conference has already been distributed under the name Bristol Cross.

84.

ADAM, D. B.

634.21-2.4-1.521.6:575

A progress report on a gummosis (dieback) disease in South Australian apricot trees.

J. Dep. Agric. S. Aust. 1938 : 42 : 14-29.

Detailed investigations on the "gummosis" disease of apricot trees are described. In the course of the work it was observed that though no varieties appear to be immune there were indications that some, notably "Tillon", possess considerable resistance.

PALMACEOUS AND OTHER FRUITS 634.6

85.

HOFMEYR, J. D. J.

634.651:577.81:575.116.1.061.6

Determination of sex in *Carica papaya*.

Fmg S. Afr. 1938 : 13 : p. 332.

In this preliminary report the author suggests that pistillate types are mm , staminate M_1m and hermaphrodite M_2m . Pistillate x staminate gives 1 pistillate: 1 staminate, pistillate x hermaphrodite gives 1 pistillate: 1 hermaphrodite and hermaphrodite x staminate gives 1 hermaphrodite: 1 staminate: 1 pistillate. M_2M plants are therefore apparently inviable. Hermaphrodite when selfed or crossed with pistillate plants always segregated into hermaphrodites and pistillate plants, indicating that M_2M_2 plants are inviable.

The factor pair $Y-y$ (yellow versus white flower) shows linkage with these sex factors, the crossover value being 35 per cent. The factors $R-r$ (yellow and red fruit flesh) and $P-p$ (purple and green stem) show no sex linkage. Yellow is dominant to red and purple to green.

86. WARDLAW, C. W. 634.653:575

The avocado (*Persea americana*, Mill.) in the West Indies.

Trop. Agriculture, Trin. 1938 : 15 : 225-26.

Cultivated avocados fall into three horticultural groups, Mexican, Guatemalan and West Indian. Seedling avocados of the last group, grown under West Indian conditions, are extremely variable. Propagation of desirable trees by grafting or budding is indicated as a means of improvement. Selection must be for characters of high yield, quality and disease resistance, and also for ability to withstand cold storage conditions without injury. Extension of the cropping season is very desirable, and may possibly be attained by importing varieties of the Guatemalan group.

Fat content is largely affected by environmental conditions, and is low in the West Indies.

SMALL BUSH FRUITS 634.7

87. TYDEMAN, H. M. 634.723:575.11
634.723:575.127.2

Some results of experiments in breeding black currants. Part II.

First crosses between the main varieties.

J. Pomol. 1938 : 16 : 224-50.

The inheritance of various characters in twenty crosses between important black currant varieties is discussed. The evidence indicates that the following characters are each controlled by two cumulative factor pairs; season of leafing out in the spring: round v. conical buds and length of fruiting raceme.

Crossing between varieties is a promising way of combining the desirable characters of various black currants. For great improvement of such characters as raceme length or fruit size beyond that at present found in the best varieties, other means must be resorted to. X-ray treatment of seeds does not appear promising, but interspecific hybridization may be the solution. *Ribes longeracemosum* has racemes 12 to 18 inches long and large, well-flavoured berries. The hybrids with *Ribes nigrum* are, however, completely sterile. Efforts are being made to induce polyploidy in the F₁ plants in order to restore fertility.

88. PARHAM, B. E. V. 634.771:581.6(96.1)

Note on a hybrid banana (I.C. 2).

Agric. J. Fiji 1938 : 9 : p. 7.

A brief note on the quality and keeping ability of the I.C.2 hybrid banana previously described (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 1424). The variety is reported to be more delicate than Cavendish and Veimana, but to have an excellent flavour. It is a promising variety for the market.

89. BIRKINSHAW, F. 634.774:575

Pineapples.

Malayan Agric. J. 1938 : 26 : 321-27.

A brief review of the cultivation of the pineapple throughout the world.

Although mainly propagated by vegetative means the seedlings that do occur show great variation. In Hawaii and Malaya crossing between varieties and between varieties and species is being carried on and fruits of a high standard of quality have been produced from crosses between Smooth Cayenne and Queen varieties in Hawaii.

A method of propagation by means of half-inch sections of the plant stem has proved successful in St. Lucia, B.W. Indies, and should be of considerable value for the rapid increase of planting material of selected plants.

FORESTRY 634.9

90. LARSEN, C. S. and 634.975:575.127.2:575.356.5
WESTERGAARD, M.

Contributions to the cytogenetics of forest trees : I. A triploid hybrid between *Larix decidua* Miller and *Larix occidentalis* Nutt.

J. Genet. 1938 : 36 : 523-30.

A single plant was obtained from the cross *Larix decidua* (2n = 24) x *L. occidentalis* (2n = 24). This was a triploid (2n = 36), which probably resulted from fusion of a normal egg cell of

L. decidua with an unreduced pollen grain of *L. occidentalis*. This triploid gives rise to a proportion of giant pollen grains which may be triploid, and it may be possible to produce a tetraploid plant by back-crossing to the *decidua* parent.

VEGETABLES 635

91. SANSOME, E. R. 635.656:575.127.2:576.356.2
A cytological study of an F₁ between *Pisum sativum* and *P. humile*, and of some types from the cross.
J. Genet. 1938 : 36 : 469-99.

In the F₁, two associations of four chromosomes were observed, and one which occurred frequently was studied in detail. The author concludes that this association involves a double structural change, *P. sativum* contributing to it the chromosomes ABX and YCD, and *P. humile* the chromosomes YBCX and DA. Various unbalanced gametes can be derived from this arrangement, and the presence of certain aberrant plants in the progeny is considered to be due to their functioning.

One semi-sterile plant studied appears to have the constitution ABX, ABX, YBCX, YCD, giving a different type of association of four. This plant is trisomic for B and X and monosomic for D, and has approximately 50 per cent of aborted pollen.

Another family contained plants which gave an aberrant ratio for green v. yellow cotyledons. These are interpreted as having the constitution ABX, ABX, YBCY, YCD. They are trisomic for B and Y and monosomic for D, and have only a small percentage of aborted pollen. Pollen grains duplicated in X therefore appear to be aborted, whereas pollen grains duplicated in Y can survive.

The chromosome with reduplicated end segments, YBCY, sometimes pairs with itself to give a ring univalent. The factor for yellow cotyledons is assumed to be in this chromosome, which is frequently lost through lagging. This would lead to the observed excess of seeds with green cotyledons.

92. SANSOME, E. 635.656:576.356.2
Segmental interchange lines in *Pisum sativum*.
Nature Lond. 1938 : 142 : 674-75.

An earlier list of interchange lines (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 883) is brought up to date by the addition of four new structural types (8 to 11). One of these, structural type 9, has, like type 2, chromosomes 1 and 2 involved in the interchange and it is inferred that the break must have taken place on different sides of the centromere in one, and one only, of the chromosomes concerned in the two interchanges.

93. 635.657-2.4-1.521.6(54.5)
 635.657 Type F. 8

New Punjab gram immune to blight.

Agric. Live-Stk India 1938 : 8 : 568-70.

All the varieties of gram grown in the Punjab proved to be susceptible to gram blight. Of 180 varieties introduced from other areas, three, all of French origin, showed resistance. These varieties have been continually selected for five years, and a new variety, F.8, produced. This is practically immune to gram blight, and seed is now being produced for distribution. It has dusky yellow seeds, larger and heavier than the usual Punjab types.

94. LUTHRA, J. C., 635.657-2.482-1.521.6
 SATTAR, A. and 635.657 Type F. 8
 BEDI, K. S.
The control of the blight disease of gram by resistant types.

Curr. Sci. 1938 : 7 : 45-47.

Resistance to blight [*Ascochyta rabiei* (Pass) Lab.] was found in four strains of *Cicer arietinum* received from Washington D.C. One of these strains is being multiplied for release under the name Type F.8.

Part II. Foreign

STATISTICS 519

95. WELLENSIEK, S. J. and HOOGLAND, J. J. 519.24
 Gemakkelijke en snelle bewerking van frequentiereeksen. (**Easy and rapid treatment of frequency distributions**).
Landbouw 1938 : 14 : 409-14.

A formula is given for the calculation by successive summation of the first four moment coefficients of a frequency distribution. It was learnt by one of the authors while attending a calculating machine demonstration at Cambridge. J. W.

96. BJERKE, Bj. 519.24:631.421
 Sammenregning av observasjoner II. Det tredimensjonale tilfelle. (**Notes on the mathematical treatment of observations II. The three dimensional case**).
Meld. Norg. LandbrHøisk 1938 : 18 : 98-111.

The author describes the algebraic procedure in the determination of the standard error for a field trial in which p varieties, for each of which there are to be s different manuring treatments, are grown at each of r different places. J. W.

97. SALMON, S. C. 519.24:633.11-2.451-1.521.6
Generalized standard errors for evaluating bunt experiments with wheat.

J. Amer. Soc. Agron. 1938 : 30 : 647-63.
 The author criticizes the tendency to use a general average estimate of standard error by analysis of variance methods, when it is unlikely that the standard errors should be all the same size, as when mean values are very different for different treatments. Data are presented from tests to determine differences in bunt infection in wheat varieties which show that the analysis of variance method of estimating random variation may be seriously in error. The standard error was found to be to a considerable degree a function of the infection, reaching a maximum at 50 per cent infection, and becoming small at 0 and 100 per cent infection. The form of the curve is similar to that expressed by the binomial distribution. A suggested alternative method of procedure is outlined. J. W.

BREEDING 575

98. GESCHER, N. v. 575:633(4)
Organization and present state of plant improvement in the different countries (continuation).

Int. Rev. Agric. 1938 : 29 : T307-12.
 This, the second article in the series (Cf. "Plant Breeding Abstracts", Vol. 8, Abst. 1430), deals with plant breeding in France, Switzerland, Germany and Poland.

99. RUDORF, W. 575:633(43)
 Die politischen Aufgaben der deutschen Pflanzenzüchtung. (**The political problems of German plant breeding**).
Ackerbau u. Landbaupolitik, Beitr. zur politischen Grundlegung der Landbauwiss., Schriftenreihe zu "Odal" Monatsschrift für Blut u. Boden
 1937 : No. 6 : Pp. 15.

Using the term political in its widest sense, the author sketches the history of plant breeding from prehistoric times and comes to the conclusion that to the Germanic peoples (among which are included the Dutch, the English and the Americans), is due the credit of laying the foundation of the science of plant-breeding. The need for Germany to become self-supporting is then stressed from the point of view of National Socialism and the methods and results of German plant-breeding in this direction are briefly recorded.

100. MÉNERET, G. 575:633(44)
 Amélioration et expérimentation de plantes de grande culture au Centre de Recherches Agronomiques de Colmar en 1936-1937. (**Improvement and experiments on the main crop plants at the centre of agronomic research, Colmar, in 1936-1937.**)
 Sélectionneur 1938 : 7 : 11-27.
 Wheats are being crossed to produce varieties suitable for moderate or very rich soils. Varieties resistant to disease and to lodging and of good baking quality are also being sought. Variety tests are described.
 Hybrids are being tested for the improvement of spring barleys for brewing and variety tests for malting quality are tabulated. The results of variety trials with potatoes, especially for their cooking quality and taste, are described.
 Varieties of lucerne, red clover and soya bean were also tested.
101. 575:633(77.8)
Fifty years in the service of agriculture, 1888-1938.
 Bull. Mo. Agric. Exp. Sta. 1938 : No. 397 : Pp. 99.
Inter alia, the plant breeding work with maize, wheat, barley, oats and soya beans and the work on plant genetics at the Missouri Agricultural Experiment Station is mentioned.
102. 575:633(79.5)
The first fifty years of the Oregon Agricultural Experiment Station 1887-1937.
 Sta. Circ. Ore. St. Coll. 1937 : No. 125 : Pp. 26.
 An important part of the work has been plant breeding and the oat variety Markton and the wheat Rex are mentioned. They were bred at the Sherman County Station, Moro.
103. 575:633:576.312
 LELIVELD, J. A. 633.73:575.12:581.162.5
 De cytologie als hulpmiddel bij de selectie. (**Cytology as an aid in breeding.**)
 Bergcultures 1938 : 12 : 847-54.
 The cytological basis of plant breeding is outlined with special reference to chromosome irregularities that arise in hybridization, and the value of such cytological knowledge is exemplified with reference to potatoes, rubber, coffee, etc. The importance of polyploidy, its relation to the perennial habit, its induction and its numerous possible applications in the practice of plant breeding are discussed. Cytology could be of assistance in elucidating defects such as sterility and the occurrence of spongy beans in coffee and also in hastening the process of selection by rendering it possible to eliminate undesirable coffee seedlings at an early stage and to reduce sterility due to incompatibility in crosses.
 The author found the specimens of Liberia which he examined have as their chromosome number $n=11$ instead of $n=22$ and he believes that two forms may exist and that this may account for the fact that in the Kawisari group (which is regarded as being composed of natural hybrids of Arabica ($n=22$) and Liberia), complements of 44 and 33, with many aberrations in division occur. The author correlates the high sterility of the pollen and percentage of spongy beans in the Kawisari B hybrids with defective endosperm development and chromosome aberrations.
 Crosses made some years ago between Arabica ($n=22$) and Robusta ($n=11$) gave numbers of very vigorous but sterile plants some of which showed a high percentage of round beans. After prolonged comparative experiments three forms, Arla Nos 1, 6 and 16, have been selected as promising mother trees. The comparative cytology of Arla and its highly sterile sister types is now being studied. This should facilitate the elimination of useless forms at the seedling stage. Diploid numbers found in Arla 1 include 22, 44 and about 88 chromosomes, while Arla 16 has 44.

104. ALEŠIN, E. I. 575:633:581.331.2.02:575.114
(Notes on breeding technique. I. Treatment of pollen as one of the basal factors of the new method).

Proc. Agric. Inst. Krasnodar Saratov 1937 : Issue 9 : 3-20.

The frequent failure to extract all possible combinations of characters in crosses is ascribed not only to linkage but to the fact that certain genetic combinations are favoured physiologically at the expense of others. The only way to overcome this would appear to be the use of some agency to alter the character of the gametes. To test this, crosses were made in 1931 between the apple Borovinka and the crab Kitaika Savinskaja and in 1932 between the apples Grušovská Moskovskaja and Borovinka; before application, the pollen was subjected to various treatments, viz. (1) low temperature, from -5° to 0°C . for 6, 12 and 24 hours, (2) high temperature, 25° - 30° and 30° - 35° for 6, 12 and 24 hours, (3) ether vapour for 4, 8 and 12 hours, (4) desiccation over sulphuric acid for 1, 2 and 3 hours, (5) direct sunlight for 12 hours, (6) direct sunlight and desiccation over sulphuric acid for 12 hours. There were clear differences in the set obtained from the different treatments, the pollen treated at 30° - 35°C . for 6 hours giving the highest set.

Similar tests were made with the gooseberry, the pollen being treated with (1) a temperature of from -5° to 0°C . for 12 hours, (2) a temperature of 0° - 5° for 12 hours, (3) 30° - 35° for 12 hours, (4) desiccation over sulphuric acid for 24 hours, (5) sunlight for 12 hours, (6) sunlight and desiccation over sulphuric acid for 12 hours.

Marked differences were observed in the progenies of the different treatments as regards the segregation for colour of shoots and pubescence, resistance to *Sphaerotheca* and plant habit; thus the percentage of plants with red twigs and red pubescence varied from 20 (30° - 35°C . treatment) to 53 (sunlight and desiccation), and the percentage with white shoots and white pubescence from 14 to 33; the percentage of immune seedlings varied from 1.2 to 14.6 (sunlight treatment), all treated families having fewer than untreated; similar variation was observed in height of plant, some treated seedlings being taller than the control (e.g. from -5° to 0°C . and 30° - 35°C . treatments).

Similar results were obtained in strawberry crosses.

Observations on pollen germination *in vitro* confirmed the influence of the treatments on pollen viability. Some agencies have the same effect on all pollen grains but some others appear to have a depressing action only on grains of a certain constitution.

105. IMAI, Y. 575.061.633:581.174:575.24
The behaviour of the plastid as a hereditary unit: the theory of the plastogene.

Cytologia, Tokyo 1937 : Fujii Jubilee Vol. : 934-47.

Variegation occurring in the leaves of *Tropaeolum majus*, *Polygonum virginianum* var. *filiforme*, *P. Blumei* and *Pharbitis Nil* is described. The author considers that this variegation is due to the mutation of a 'plastogene', which is contained in the chloroplast and which divides equationally before the chloroplast divides. Such mutation may be conditioned by the genotype of the plant (exomutation). He considers that in *Tropaeolum*, for instance, mutation of the plastids from green to yellow is conditioned by the recessive gene for variegation. The green flecks which occur in the yellow parts of the leaf he attributes to automutation of the plastogene from yellow back to green. Where this automutation is held to occur frequently, as in *Tropaeolum*, the seedlings are almost entirely green, and variegation occurs only in the later leaves. The author considers this to be due to the arrest during gametogenesis of the exomutation of the plastids from green to yellow, accompanied by a high frequency of automutation from yellow to green.

GENETICS 575.1

106. CHIARUGI, A. 575.1:633
I problemi della genetica studiati nel mondo vegetale. (Genetical problems studied in the plant kingdom).

Boll. Soc. Ital. Biol. Sper. 1937 : 12 : 3-29, 513-39.

The problems studied are:—the relation of genetics to the various stages at which meiosis

occurs in the ontogenetical cycle; the problem of the action time of the genes in relation to the alternation of generations; and the importance of polyploidy, especially in cultivated plants.

107. CRESCINI, F. 575.1:633
Le applicazioni della genetica nel campo fitotecnico. (The applications of genetics to plants from the practical standpoint).
Boll. Soc. Ital. Biol. Sper. 1937 : 12 : 554-71.

A brief review of the practical results of plant genetics before and after Mendel.

108. SEKUN, P. F. 575.12:575.148:633.11
(Results of testing and multiplication of seed from intravarietal crossing).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 3 : 20-23.

In the winter wheat variety Moskovskaja 02411, described as of 100 per cent purity, sown apart from other varieties, 3,180 ears were emasculated and left for open-pollination. The seed obtained was sown in half-row strips with uncrossed seed for comparison. The grain weight and germinating capacity were the same in each but the young seedlings from the crossed seed were more vigorous in growth and darker in colour; in the following spring their dry weight was 16 per cent greater and tillering 17 per cent greater than the controls. They produced 10 per cent more ears per plant and an excess yield of 30·6 per cent and were also more winter-hardy than the controls.

Similar results were obtained with other wheats, though the response varied in different varieties and in different years.

109. STURTEVANT, A. H. 575.127.2:581.162.5
Essays on evolution III. On the origin of interspecific sterility.
Quart. Rev. Biol. 1938 : 13 : 333-35.

Genetical and cytological mechanisms reducing the fertility of the F_1 hybrid are outlined and a hypothetical scheme proposed whereby natural selection could further reduce the fertility to the point of sterility.

110. LIESEGANG, R. E. 575.17:576.312.34
Chromosome und Gene. (Genes and chromosomes).
Umschau 1937 : 41 : p. 593.

Some of the genetical advances made possible by the finding of the giant chromosomes of the salivary glands of certain larvae and Caspersson's discovery that ultra-violet light discloses much of the finer structure of the chromosomes are briefly noted.

111. MELCHERS, G. 575.182
Nicht mendelnde Vererbung. (Non-mendelian inheritance).
Umschau 1938 : 42 : 579-82.

A brief and popular account of the principles of maternal inheritance.

112. MICHAELIS, P. 575.182
Über die Konstanz des Plasmons. (On the constancy of the plasmon).
Z. indukt. Abstamm.- u. VererbLehre, 1938 : 74 : 435-59.

The objections, especially those of Lehmann, to the assumption of an independent inheritance of the plasma in *Epilobium* are answered in detail in the first part of this paper. In the second part the proofs of the changes occurring in the plasma are discussed and lastly the peculiarities of plasmatic inheritance are considered.

113. KNAPP, E. 575.182:575.12
Über genetische bedeutsame Zellbestandteile ausserhalb der Chromosomen—(Eine Theoretische Untersuchung). [On genetically significant cell constituents other than the chromosomes (A theoretical investigation)].
Biol. Zbl. 1938 : 58 : 411-25.
The author, disavowing any intention of formulating hypotheses or theories about the genetical significance of the cytoplasm or on the nature of the genetically important substances therein, discusses the connotation of the term "inheritance" (Vererbung) as compared with "transmission" (Übertragung) and then passes on to a number of speculations upon the possible nature of that part of the cell cytoplasm concerned in inheritance and upon the implications of these various theories applied to the problem of the existence or absence of differences in reciprocal hybridization.
The discussion is essentially hypothetical, but possible applications of the argument to explain the phenomena of "Dauermodification" and of cell determination are indicated.
114. . 575.24:575.17
KERKIS, J. J. 576.12
(The stability and variability of genes).
Priroda (Nature) 1938 : No. 3 : 64-78.
In considering the most recent data on gene mutation the author shows that if the mutation rate in all organisms is of the order of that observed in *Drosophila* this is entirely adequate to supply the necessary material for natural selection. Emphasis is laid on the fact that mutations that in existing circumstances are indifferent or deleterious, may under altered circumstances have a positive selection value; this may at times result in an adaptive effect giving a false analogy to the inheritance of an acquired modification.
Various arguments, theoretical and practical, are adduced against the view that the direction of mutation can be artificially controlled, which view is moreover not in harmony with Darwin's principle of random change. The results of position effect, the interaction of genes, etc., in supplying material for selection are also discussed and the conclusion reached that modern genetics is in no contradiction with Darwin's theory but has only served to modify and amplify it.
115. KRAJEVOJ, S. J. 575.243
(On the experimental production of mutations in plants).
Bull. Acad. Sci. U.R.S.S., Sér. Biol. 1937 : 427-58.
A full review is given of the literature on the subject, different aspects of the subject being treated separately. In the section on the possibility of producing "useful" mutations artificially it is pointed out that so far no mutants with greater survival value in natural conditions have been induced: no experiments on a sufficiently extensive scale have been carried out on this line however. Mutants of practical interest have been obtained by a number of investigators. Reference is also made to unpublished work of F. A. Pis'menko who by X-ray treatment of the barley, Medicum 046, in the vegetative and reproductive phases obtained forms with tubular leaves and broad awns, with reduced or no awns, late forms with recurved ear base, forms with dense ears and forms with long awns (4-5 cm.) on the empty glumes and 30 spikelets instead of the usual 24. All these deviations are hereditary. The last-named is vegetatively also more vigorous and this and the awnless mutant are of definite practical interest.
Several cases of reverse mutation are referred to and it is concluded that mutation constitutes an alteration but not a destruction of the gene. The rate of occurrence of spontaneous mutations is about 1-3 per cent and the author opines that these, together with the changes induced by hybridization, are sufficient to provide the material for natural selection. The majority of these mutations are not of a gross morphological type such as those detected in experiments on artificial induction, but small changes affecting the internal balance of the plant.

116. CHATTERS, R. M. 575.243:537.5
Introduction by fast neutrons of mutations in *Antirrhinum* and *Myosotis*.
 Science 1938 : 87 : (N.S.) : 241-42.
 Seeds of *Antirrhinum* and *Myosotis* exposed to stray emanations from a cyclotron gave rise to plants varying in flower colour and flower morphology. The inheritance of these changes is to be studied.
117. CHATTERS, R. M. 575.243:537.5:581.48:578.088.7
Induction by fast neutrons of mutations in plants grown from irradiated dry seeds.
 Chronica Botanica 1938 : 4 : p. 391.
 Seeds from six genera were exposed to bombardment by fast neutrons for periods of from one to nine weeks. Germination was in some cases reduced to 5 per cent of the control, in other cases not affected at all. The most general effect was a reduction in size of the plants grown from bombarded seed.
 In *Antirrhinum* several changes in flower colour were observed in two cultures. In *Myosotis* various malformations of the floral organs were induced, and in *Oenothera franciscana* various changes in leaf form were observed.
 The genetical causes of these changes are being investigated.
118. KOLESNIK, I. D. 575.321:634
(Production of a variety without hybridization).
 Seleksiya i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 7 : 24-26.
 Suckers from an apple tree growing on its own roots were grown under different conditions of soil, temperature and light, and the resulting plants, which have not yet come into bearing, already show vegetative differences. Three pear trees growing together and stated to be from the same root were planted in different soils and have given rise to trees bearing fruits of quite distinct characters. Seedlings of tender southern plants raised in the north have often given rise to quite hardy varieties. These and other similar observations lead the author to urge planters to carry out similar experiments in the attempt to produce new and improved varieties in as short a space of time as possible.
119. WRIGHT, S. 575.42:519.24
 575.24
The distribution of gene frequencies under irreversible mutation.
 Proc. Nat. Acad. Sci. Wash. 1938 : 24 : 253-59.
 The problem is treated mathematically and it is concluded that only under certain special conditions would evolutionary change be possible.

EVOLUTION 576.12

120. WRIGHT, S. 576.12:519.24
Size of population and breeding structure in relation to evolution.
 Science 1938 : 87 : (N.S.) : 430-31 (Abst.).
 A mathematical treatment of the influence of population size on evolutionary changes.

ORIGIN OF SPECIES, ETC. 576.16

121. BREMEKAMP, C. E. B. 576.16
 Taxonomie, cytologie en genetica. (Taxonomy, cytology and genetics).
 Vakbl. Biol. 1935 : 17 : 37-43.

HAGEDOORN, A. L. and

HAGEDOORN, A. C.

Het genetische soortsbegrip. Een kritick en een antwoord. (**The genetic concept of the species. A critique and a reply.**)

Vakbl. Biol. 1935 : 17 : 44-8.

SIRKS, M. J.

Nogmaals: het genetische soortsbegrip. (**Once more—the genetical concept of the species.**)

Vakbl. Biol. 1936 : 17 : 151-54.

The first author refers to Sirks paper ("Plant Breeding Abstracts", Vol. VI, Abst. 1162) and while admitting the value of cytological evidence in plant systematics, considers it to be of no more significance than the accepted morphological evidence, to which it should provide a valuable supplement. Similarly with respect to genetics, certain simple genetic characters are of great systematic importance, others of little or none.

The Hagedoorns point out that the principle of Sirks that all forms, however different genetically, that are identical as regards their chromosome morphology, can be classed as one species, is shown to be inapplicable to lower organisms, and to animals (when heterochromosomes are always present). The authors maintain that specific characters and differences are much deeper than the morphological features treated by Sirks, and rest in the chemical nature of the plant itself. The order of differences it is possible to detect in the chromosome morphology is moreover entirely a matter of technique; and minor chromosome differences can often be detected within what is to all intents and purposes a pure species.

The authors' definition of a species is a group of organisms such that "it tends automatically to reduce its total potential variability and for this reason tends to become pure for one specific type".

Dr Sirks, in reply to the critics remarks that he regards his cytogenetic species concept as an adjunct to and not as a substitute for the existing concepts; he confined his remarks to the autosomes and the Hagedoorns' reference to the XY chromosomes, etc., was not, therefore, relevant.

122. WITTENROOD, H.

576.16

575.22

Het ontstaan van soorten. (**The origin of species.**)

Erfelijkheid in Praktijk, Leiden 1938 : 3 : 93-94.

In discussing the theory of the Hagedoorns of the origin of species by isolation, reference is made to experiments showing that all gene variants vary in viability; the survival value of a form cannot be estimated theoretically but only determined by experiment and is dependent on the interaction of the gene with a large number of environmental factors. The effect of this on the resultant population is illustrated for various types of interaction and shown to correspond closely with the type of distribution often observed in nature; more so in fact than expected on the basis of the Willis theory of age and area.

CYTOTOLOGY 576.3

123. LEVITSKI, G. A.

576.312(47)

(**Soviet cytology for twenty years.**)

Priroda (Nature) 1937 : No. 12 : 40-50.

The author enumerates the various centres of cytological activity in the U.S.S.R. and the cytologists associated with them, with an account of their achievements, most of which have been individually referred to in "Plant Breeding Abstracts". Among the unpublished work mentioned are the observations of the full chromosome complement of the diploid oats in the tetraploid series by E. M. Šepeleva and the production of a tetraploid barley by G. D. Karpechenko by heat treatment.

124. KUWADA, Y. 576.312:576.353
The hydration and dehydration phenomena in mitosis.
 Cytologia, Tokyo 1937 : Fujii Jubilee Vol. : 389-402.
 The author considers it likely that coiling of chromonemata occurs in two steps (1) the chromonema threads are brought into a twisted state by anisotropic imbibition of water, and (2) when the imbibed water is finally distributed evenly, the threads are forced to untwist. This untwisting is accomplished by the transformation of the twist into a spiral, which is condensed into a regular and compact form by the contracting force of the chromosome matrix.
125. SHINKE, N. 576.312:581.032
An experimental study on the structure of living nuclei in the resting stage.
 Cytologia, Tokyo 1937 : Fujii Jubilee Vol. : 449-63.
 Certain plant and animal resting nuclei have an apparently homogeneous structure, except for the presence of the nucleolus. Others contain chromocentres, or have a granular appearance, and in still others the chromonemata may be clearly distinguished. As a result of experiments in which hypertonic and hypotonic solutions were applied to living nuclei, the author concludes that all these resting nuclei have fundamentally the same structure, the differences being merely due to differences in the degree of hydration of the chromonemata. At certain levels of hydration, the chromonemata have the same refractive index as the karyolymph, so that the nucleus is optically homogeneous.
126. RUTTLE, M. L. and NEBEL, B. R. 576.312.32:576.353:576.354.4
Chromosome structure XI. *Hordeum vulgare* L. and *Secale cereale* L.
 Cytologia, Tokyo 1937 : Fujii Jubilee Vol. : 553-68.
 Observations of the chromosomes of rye, barley and crocus have led the authors to the conclusion that at all stages they consist of the same number of strands as do the chromosomes of *Trillium* and *Tradescantia*. Their conclusions are that during mitosis the chromosomes consist of four strands arranged in pairs during anaphase, telophase, interphase and prophase. At metaphase eight strands become visible, giving an anaphase separation of chromosomes with four strands each. The premeiotic telophase is similar. At metaphase I each chromosome of a bivalent consists of eight strands. Interphase nuclei consist of 8-partite chromosomes. No new split occurs during the second division, so that the metaphase II chromosomes are also 8-partite. Anaphase separation gives the usual 4-partite chromosomes as in an ordinary mitosis.
 While the authors state that the 'split' during mitosis is first visible at metaphase, they acknowledge that it may actually occur at an earlier stage.
 Their interpretation of the prophase of meiosis is as follows. There are four threads per chromosome during the last pre-meiotic telophase. The half-chromatids are no longer visible during interphase, pre-leptotene and very early leptotene, when the chromosomes appear to be double. During leptotene the chromatids as well as the half-chromatids become very closely approximated, so that the chromosomes consist apparently of a single thread only. At pachytene each chromosome is again visibly double, and at diplotene and diakinesis the original four-partite structure is once more apparent.
127. NAKAJIMA, G. 576.312.332:582
Cytological studies in some dioecious plants.
 Cytologia, Tokyo 1937 : Fujii Jubilee Vol. : 282-92.
 Male individuals of dioecious plants of 11 genera were studied cytologically. In all cases except three, one unequal pair of chromosomes was observed in meiosis, and it is assumed that this represents a sex-determining mechanism of the XY type. The forms which had this mechanism were: *Populus Sieboldii*, six species of *Salix*, *Buckleya Joan*, *Coccus trilobus*, *Xanthoxylon piperitum*, two species of *Trichosanthes*, two *Dioscorea* species, and two species and one variety of *Smilax*.
Humulus lupulus var. *cordifolius* had a chain of four chromosomes, normally arranged in an N-formation. This is assumed to be a sex-determining mechanism of the XYXY type.

128. MATHER, K. 576.312.34:576.354.46
The determination of position in crossing-over. II. The chromosome length-chiasma frequency relation.
 Cytologia, Tokyo 1937 : Fujii Jubilee Vol. : 514-26.

A study is made of the relationship between chromosome length and chiasma frequency in certain organisms which have a large range of chromosome size. The curve showing this relationship consists of two parts, a flat lower end, where chiasma frequency equals one, irrespective of the chromosome size, and an upper sloping portion where the chiasma frequency increases with chromosome length. The author interprets these two parts of the curve as follows: a first chiasma is formed irrespective of the chromosome length, i.e. it is formed even in very short chromosomes. The length of chromosome occupied by this first chiasma (the 'differential distance') increases as the chromosome size increases, up to a certain maximum. The formation of a second and subsequent chiasmata, occurs at a mean distance (the 'interference distance') from the directly previous one which is constant throughout the chromosomes. The sloping upper part of the curve is completely described in terms of two parameters, its slope depending upon the interference distance and its position upon the mean length of chromosome occupied by the first chiasma. These two parameters are capable of independent variation. It is concluded from the cytological data that chiasma formation must be determined from some fixed point in the chromosome, and must follow a regular sequence. This fixed point has been shown to be the centromere in the case of *Drosophila melanogaster*.

Some organisms exist in which a single chiasma does not regularly occur in very short chromosomes. It is concluded that these aberrant cases are due to incomplete pachytene pairing, or some similar disturbance.

129. HUSKINS, C. L. 576.312.341:576.353:576.354.4
The internal structure of chromosomes—a statement of opinion.

Cytologia, Tokyo 1937 : Fujii Jubilee Vol. : 1015-22.

A brief survey of the views held by various authors on the subject of chromosome spirals and on the number of threads per chromosome existing at various stages. The author concludes that the evidence that chromosomes consist of at least two strands at mitotic anaphase, and that meiotic bivalents consist of at least eight strands, is overwhelming.

130. HEILBORN, O. 576.312.38
Notes on chromosome associations.

Cytologia, Tokyo 1937 : Fujii Jubilee Vol. : 9-13.

The author objects to the use of the terms 'secondary association', 'secondary attraction' and 'secondary pairing', as he considers that they are founded on unproved theoretical assumptions. He suggests that the term 'association' alone should be used.

Work on *Carex* and *Pyrus* has led to the conclusion that this type of association is always one of chromosomes of similar size, and the author attributes it to mechanical causes other than any specific attraction due to chromosome homology. He concludes, however, that the study of 'secondary association' will still be of value in the studies of secondary polyploidy.

131. BUCHINGER, A. 576.341:575
Die Saugkraft im Dienste der Pflanzenzüchtung. (Osmotic pressure in the service of plant breeding).

Landeskultur 1937 : Nr 6 : Pp. 8.

The method for measuring the osmotic pressure of seeds is described and experiments have shown that high yield and resistance to cold and to drought are connected with high osmotic pressure.

The osmotic pressure is a heritable character and the advantages to plant breeders of the use of this method are pointed out. Much time and labour may be saved by selecting seeds by this means.

132.

MANGENOT, G.

576.35:581.04

Effets de la colchicine sur la mitose dans les racines d'*Allium Cepa* et d'
Hyacinthus orientalis. (Effects of colchicine on mitosis in the roots
of *A. cepa* and *H. orientalis*).

C.R. Soc. Biol., Paris 1938 : 128 : 501-04.

MANGENOT, G.

Hypertrophies des racines produites par la colchicine chez quelques plantes.
(Hypertrophic effects of roots produced on some plants by colchi-
cine).

C.R. Soc. Biol., Paris 1938 : 128 : 565-68.

The first paper deals with the action of colchicine on mitosis. The effect of colchicine is only apparent on dividing cells and in these only after prophase.

In the second paper a swelling of the roots as a result of colchicine is recorded and is most noticeable in rapidly growing roots.

133.

SHIGENAGA, M.

576.353:578.088.1:581.032.3

An experimental study of the abnormal nuclear and cell divisions in
living cells.

Cytologia, Tokyo 1937 : Fujii Jubilee Vol. : 464-78.

Cell divisions in petals of *Tradescantia reflexa* were observed in living material, after treatment with chloral hydrate, nicotine and caffeine. These substances were found to lead to the production of tetraploid giant nuclei, binucleate cells, and binucleate cells with incomplete septae, when the treated tissues were subsequently placed in a hypotonic solution or in water. Binucleate cells were similarly produced by treatment with ethyl alcohol and chloroform, with the same after-treatment.

Similar results were obtained with the use of hypertonic sugar solutions, so that it was concluded that the above narcotics act merely through dehydration of the cytoplasm. Dehydration of the spindle inhibits the migration of chromosomes to the poles, and also inhibits cell membrane formation. In a sugar solution of high concentration, movement of the chromosomes to the poles is entirely suspended. When this treatment is followed by treatment with hypotonic sugar solution or water, the chromosomes become 'unravelled' and form a single tetraploid resting nucleus, a dumb-bell shaped double nucleus, two nuclei not separated by a cell wall, or two nuclei separated by an incomplete cell wall, according to the stage at which the suspension of movement took place.

In hypotonic sugar solutions, telophase chromosomes did not become 'unravelled' to form resting nuclei—this unravelling was only possible in a hypotonic solution.

134.

BEAMS, H. W. and

576.353:581.04

KING, R. L.

576.353:578.088.2

An experimental study on mitosis in the somatic cells of wheat.

Biol. Bull. 1938 : 75 : 189-207.

Colchicine treatment of germinating wheat grains inhibits the formation of an achromatic spindle. Chromosomes at metaphase are loosely arranged and sometimes segregate into groups. A single large restitution nucleus is often formed, thus leading to a doubling of the chromosome number. This process may be repeated several times in some cells.

Cells which have partially recovered from this treatment show many abnormalities. A separate spindle may arise from each of a number of groups of chromosomes, subsequent division leading to the formation of several daughter cells of different sizes.

Evidence is presented which suggests that colchicine lowers the viscosity of the cytoplasm. Centrifuging at high speeds leads to a stratification of the cell contents in the order of their relative specific gravity. When this is done at metaphase, the whole spindle is usually displaced to one end of the cell, and the subsequent division is more or less normal. Sometimes, however, chromosomes are thrown clear of the spindle, and multipolar spindles may also be produced.

Centrifuging at anaphase or early telophase usually leads to the formation of a binucleate cell, or in some cases to a cell with a single restitution nucleus. It is possible, therefore, that chromosome doubling may be induced in this way.

135.		576.354.4 575.116.12 576.356.5 575.11:033.11
------	--	---

KIHARA, H.

A few problems in kario-genetics.

Bot. and Zool. 1934 : 2 : 173-82.

A survey accompanied by discussion of some findings from research up to 1933 on the theories and problems relating to chiasma formation (including Mayeda's work on *Vicia*), the mechanism of crossing-over, haploidy and its experimental production, mutation of fatuoids and speltoids, and finally genom analysis and its development from 1909 up to the time of the author's own work on wheat.

136.	LEVITSKIJ, G. A.	576.354.46:575 On the genotypic control of structural chromosome changes.
------	------------------	--

C.R. (Doklady) Acad. Sci. U.R.S.S. 1937 : 15 : 559-62.

A study of the number of structural changes found in the families of X-rayed plants of *Crepis capillaris* showed that certain families were more prone to produce structural chromosome changes than others and it is suggested that this tendency is a characteristic of the genotype.

137.	STURTEVANT, A. H. and MATHER, K.	576.356.2:575.125:575.116.1 The interrelations of inversions, heterosis and recombination.
------	-------------------------------------	---

Amer. Nat. 1938 : 72 : 447-52.

In an inversion hybrid, crossing-over is eliminated within the inverted region unless the inversion is a very long one. The establishment in a population of an inversion therefore leads to two distinct lines of descent for the chromosome involved with free exchange of material within each line, but none between the lines. This in turn leads to a differentiation in gene content between the lines and since the majority of mutations are deleterious recessives, the hybrid combining the two lines will show heterosis and will therefore be favoured by natural selection. It is shown that the two lines, once established, will tend to exist in the population with equal frequency.

In examining wild populations it is found that not all chromosomes are heterogeneous for gene sequence. This is considered to be a consequence of the selective advantage of gene recombination. A hypothesis explaining this advantage is proposed. If an inversion in a given chromosome becomes established in the population, then, it is stated, a second inversion in that chromosome will cause less reduction in crossing-over than a new inversion in a different chromosome. The two effects, heterosis and recombination reduction, are considered as in opposition, their balance determining the fate of inversions arising in a wild population.

138.	WRIGHT, S.	576.356.2:575.42 The distributions of gene frequencies in populations of polyploids.
------	------------	---

Proc. Nat. Acad. Sci. Wash., 1938 : 24 : 372-77.

A mathematical treatment of the problem.

139.	CH . . . , P.	576.356.5:581.04 Le rôle de la colchicine. Les recherches récentes du Professeur A. F. Blakeslee sur la production de plantes géantes et de variétés nouvelles par l'emploi de la colchicine. (The role of colchicine. The recent researches of Professor A. F. Blakeslee on the production of giant plants and new varieties by the use of colchicine).
------	---------------	---

Rev. Hort. Paris 1938 : 110 : 103-06.

A brief review of the methods and results of the production of polyploid plants by means of colchicine.

140. GYÖRFFY, B. 576.356.5:581.04
 Durch Kolchizinbehandlung erzeugte polytrope Pflanzen. (**Polytroid plants produced by colchicine treatment**).
Naturwissenschaften 1938 : 26 : p. 547.

A brief note on the methods and results of the use of colchicine.

141. SIMONET, M. 576.356.5:581.04:633.52
 De l'obtention de variétés polyploïdes à grandes fleurs après application de colchicine. (**The production of large-flowered polyploid varieties after the application of colchicine**).
Rev. Hort. Paris 1938 : 110 : 159-61.

A description of tetraploid varieties of petunia and of flax obtained by treatment with colchicine.

142. PRATASSENJA, G. D. 576.356.5:581.48:575-181
 633.71:576.356.5
Studies on polyploid plants. Parallel variation.
 C.R. (Doklady) Acad. Sci. U.R.S.S. 1938 : 19 : 525-30.

Autopolyploidy was found to lead to an increase in seed size in *Pelargonium roseum*, *Solanum lycopersicum* and *Nicotiana glauca*. A similar increase in seed size occurred in the amphidiploid *N. Tabacum* x *glauca*, but in the amphidiploid *N. rustica* x *N. Tabacum* seed size was intermediate between that of the two parents. Evidence is presented which indicates that in *N. glauca* the chromosome size is diminished when the chromosome number is doubled. Chromosome doubling in *N. glauca* and in the hybrid *N. rustica* x *N. Tabacum* led in each case to the appearance of a recessive leaf character, i.e. fanlike arrangement of the side veins.

143. ARWIDSSON, T. 576.356.5:581.9
 Einige neue Gesichtspunkte zu den Chromosomenzahlenbestimmungen.
 (**Some new points of view on the determination of the chromosome number**).
Svensk. Bot. Tidskr. 1938 : 32 : 191-208.

The author stresses the importance of chromosome numbers for the elucidation of problems in systematic botany and urges the value of cytology combined with plant geography and botany for future investigations.

BOTANY 58

144. BEATUS, R. 581.162.52:575
 Die Selbststerilität. (**Self-sterility**).
Biologe 1938 : 7 : 281-88.

The problem of self-sterility is discussed in the light of the results of modern researches.

145. REDINGER, K. 581.163:576.356.5:581.162.3:633.71
 Über die Entstehung diploider Embryonen aus unbefruchteten, mit gattungsfremdem Pollen bestäubten Samenanlagen von *Petunia nyctaginiflora*. (**On the origin of diploid embryos from unfertilized ovules of *P. nyctaginiflora* pollinated with foreign pollen**).
Biol. Zbl. 1938 : 58 : 142-51.

After emasculation *P. nyctaginiflora* ($n = 7$) was pollinated with *Salpiglossis variabilis* and *Nicotiana Tabacum* pollen. No haploid plants resulted, but a few normal diploid seeds were obtained as a result of failure of the haploid eggcell nucleus to divide. In one instance this omission occurred twice in succession, thus leading to the formation of an embryo with a tetraploid nucleus which in division showed two plates in which 28 chromosomes were clearly discernible.

146. ERNST, A. 581.46:575
 Stammesgeschichtliche Untersuchungen zum Heterostylieproblem. (**Phylogenetical investigations on the problem of heterostyly**).
Ber. Schweiz. Bot. Ges. 1938 : 48 : 85-238.
- ERNST, A.
 Untersuchungen zur Phänanalyse, zum Fertilitätsproblem und zur Genetik heterostyler Primeln. 3. Die F_1 Bastarde *Pr. (hortensis x viscosa)*. [**Investigations on the phenotypic analysis, the fertility problem and the genetics of heterostylous primulas. 3. The F_1 hybrids *Pr. (hortensis x viscosa)***].
Arch. Klaus-Stift. Vererb-Forsch. 1938 : 13 : Pp. 381.
 Detailed investigations on the problem of heterostyly in primula and in primula hybrids from the systematic and genetic points of view.
- AGRICULTURE 63**
147. RUDLOFF, C. F. 63.00.15(43)
 Die Versuchs- und Forschungsanstalt für Wein-, Obst- und Gartenbau in Geisenheim am Rhein. (**The experiment and research institute for vine and fruit growing and horticulture at Geisenheim am Rhein**).
Biologe 1938 : 7 : 241-76.
 634.835:575
 634.5:575(43)
- The history of the institute and the work of the various departments are described. Several of the departments are of special interest to plant-breeders. In vine-breeding, problems of breeding vines resistant to phylloxera and *Plasmopara* are being worked out and crosses and selections made for improvement of quality and other characters. Special attention is also being paid to the breeding and improvement of walnuts and hazelnuts. Breeding is also carried out on aromatic and ornamental plants.
148. BROEKEMA. 63.0015(49.2)
 De beteekenis der associatievorming voor de Plantenveredeling. (**The importance for plant improvement of the formation of associations**).
Erfelijkhed in Praktijk, Leiden 1938 : 3 : 123-25.
 575:633(49.2)
- The phenomenon discussed in this address is the growing tendency to establish research centres concerned, not with special problems, but with investigations on particular crops and with the co-ordination of all research workers, advisory officers and practical workers dealing with the crop in question. The functions of such co-ordinated "associations" are to formulate problems for solution and schemes of research, deputing where possible the individual problems to existing bodies and in such a way that mutual co-operation between the various research workers, the practical agriculturist, industry and commerce is established. The testing of discoveries and their application in practice might also come within the scope of the "association". Instances of this type of co-operation in Holland are: the Instituut voor Suikerbietenteelt (Institute for Sugar Beet Breeding), the Technische Tarwe-Commissie (Technical Committee on Wheat), the Nationaal Comité voor Brouwgerst (National Committee for Malting Barley) and the Studiecommissie voor Vlas (Committee for the Study of Flax). A similar body is expected to be established shortly to deal with potato problems and the formation of another to co-ordinate work on clover seed is under consideration. An association dealing with grass seed already exists. It is possible that a station at Wageningen to form the centre of these various associations may also be established and this would in the writer's opinion increase the value of the research undertaken by providing improved facilities and bringing the scientific worker into closer contact with plant breeding and its practical problems.
 The contribution of the agriculturist to these developments would consist in the highly important work of collecting observations, carrying out simple experiments or demonstrations

and the application of useful new discoveries in practice. One of the main repercussions of such methods of research upon plant breeding would be the realization of the value of that branch of science to the farmer in the development of new types and the recognition of the importance of the genotype as the basis of crop improvement. Collaboration between the scientific and practical worker is essential in the creation and selection of valuable new forms.

149.

63.0015(92)

633.912:575.42(92)

633.73:575.42(92)

COOLHAAS, C.

Eenige richtlijnen voor het Proefstationswerk. (**Some lines of development for the work of the Experiment Station**).

Bergcultures 1938 : 12 : 838-46.

An address on the organization, functions and activities of the Central and East Java Experiment Station and on its future lines of development and the relations between the research done by the Station and the investigations carried out by planters and the technical and advisory workers.

In addition to the delimitation and general co-ordination of plant improvement work in its various aspects such as plot trials, disease resistance experiments, and investigations on quality, physiological and cytological phenomena, etc., the speaker discussed the need for continuity in research which should be limited to a few main problems relating to coffee, rubber and cacao and should also be more or less independent of economic vicissitudes.

In the improvement of coffee and rubber any further selection in old seedling plantations is regarded as unlikely to produce still better types, unless it be for some character not hitherto considered in selection, such as resistance to a particular disease or some abnormal climatic environment. The various clones derived from the above plantations probably represent different combinations of universally good characters, though one clone or family (i.e. a certain genotype) may be more successful in one district than in another, while another clone with a different, but also good, combination of genetic factors may do better in some other district. Clones should therefore be regionally tested and for rubber the Experiment Station work is limited to this aspect, which is also the main investigation as regards coffee clones.

The Experiment Station contemplates crosses with some interesting local rubber clones recently found on the estates and little known elsewhere.

Discussing the preliminary testing of coffee hybrids at Soember Asin, the author maintains that this work should be greatly extended and developed and suggestions are also made for improving the continued selection work involved and reducing its cost. Similar lines of development are suggested for rubber investigations and will be embarked on as soon as the necessary clones come into tap.

The paper was followed by an active discussion.

FIELD TESTS 631.421

150.

FORESTER, H. C.

631.421

Design of agronomic experiments for plots differentiated in fertility
by past treatments.

Res. Bull. Ia Agric. Exp. Sta. 1937 : No. 226 : 139-72.

Various methods of design were studied on an experimental field which had been used for a fertilizer trial, and for which crop yield data were available for each harvest since 1915.

Where a block of the new experiment can be accommodated in a single plot of the old trial no special difficulty arises. Special treatment is desirable, however, where the new blocks overlap several of the original plots.

Grouping plots of equal fertility, as indicated by previous yield, in different parts of the field to make up the blocks, gave little more precision than adjacent plot grouping. The best method proved to be adjacent plot grouping plus the use of covariance on the basis of previous yields. Covariance on the basis of one previous year's yield doubled the efficiency of an

experiment with adjacent plots, and multiple covariance on the basis of two years previous results trebled the efficiency, as an average.

The actual increase of efficiency due to the use of covariance was found to be more or less proportional to the heterogeneity of the field. In years where the greatest differences between plot yields occurred, the error variance was reduced to as little as 1/10th to 1/16th of the total variance; in years when the smallest differences were observed, the error variance was only reduced to one half or one third. The covariance method is therefore likely to be worth while only in experimental layouts where great heterogeneity exists.

An actual example is given of the use of a "split plot" experimental design, in which each block coincided with a single plot of the original experiment.

151. MING, W. C. 631.421
(Comparison between some methods of estimating field experimental errors).

Proc. Crop Sci. Soc. Japan 1937 : 9 : 97-112.

The author reviews various methods of carrying out field experiments in agriculture, and of analysing the results statistically. He pronounces in favour of the methods of analysis of variance, and describes in some detail the methods of randomized blocks and the Latin square. The statistical analysis is fully worked out, including the use of the z distribution for testing the significance of the results.

J. W.

152. POPE, O. A. 631.421:519:633.51
The applicability of certain recent experimental designs to cotton research.

Proc. 39th Annu. Convent. Ass. S. Agric. Wkrs, Atlanta, Ga 1938 : 66-67.
(Abst.).

The advantages of the use of "factorial" designs in field experimentation are outlined. Such designs enable the worker to test the effect of several different factors at once, and to determine the degree of interaction between the factors.

153. LOVE, H. H. and 631.421:633.1
CRAIG, W. T.
Investigations in plot technic with small grains.

Mem. Cornell Agric. Exp. Sta. 1938 : No. 214 : Pp. 26.

Data are presented for two oat crops to show the effect of varying size of plot and number of replications on the size of the standard error of yield determinations. 15 foot rows are found to be more desirable than 30 foot rows, since by using more replications it is possible to get equally accurate results on less land. A small number of single row plots is satisfactory for preliminary elimination of the most undesirable varieties. For final determination eight to ten 3-row blocks enable one to measure small differences with considerable accuracy. Eight to ten single rows of each variety may be used at an intermediate stage.

Various methods of interpreting the results of check plots are discussed. 'Gain' or 'loss' values of varieties, as compared with a check, are more reliable over a number of years than the yields of the varieties themselves.

Studies on the effect of competition between adjacent plots in an experiment show that at Ithaca it is not serious enough to affect the relative yields of varieties, even where adjacent plots carry very different stands, as in a winter-hardiness trial. It is considered to be preferable to harvest all three rows of a three-row block, rather than to discard the two outside rows. A comparison of systematic and randomized arrangement of varieties shows that, in general, the relative yields are the same and the same varieties would have been picked out as the best. The author concludes that for the purposes of practical plant breeding a systematic arrangement is satisfactory if the individual worker prefers it.

These experiments refer chiefly to tests of a very large number of varieties, where any ordinary system of replication in blocks cannot be employed.

PLANT DISEASES 632

154.

- GOTO, K. 632.482:575:635.651
Sclerotium rolfsii Sacc. in perfect stage. V. Inoculation studies
 with natural strains, basidiospores, single basidiospore isolates,
 and some F₁-, F₂- and back cross strains obtained by mating.
 632.472.3

Ann. Phytopath. Soc. Japan 1938 : 8 : 203-20.

The pathogenicity of various strains of *Sclerotium rolfsii* in the *Corticium* stage, as determined by inoculation tests on *Vicia faba* and various other crop plants, is compared with that of *S. delphini*. Strains from single basidiospores were weakly pathogenic, and may be innocuous in nature. F₁ progeny (secondary strains) were more virulent. Among the F₂ strains tested was one which was more virulent than either of its parents.

155.

- HUITEMA, W. K. 632.951.1:575.42:581.192.6
 Selectie en landbouwkundig onderzoek bij *Derris*. (Selection and
 agricultural research with *Derris*).
 632.951.1:575.127.2

Bergcultures 1938 : 12 : 1035-41.

The importance of acquiring for research purposes a representative collection of wild and other varieties in the Netherlands East Indies has been recognized and between 1932 and 1935 some thousands of specimens (mainly belonging to *D. elliptica*) have already been gathered under the direction of the Landbouwkundig Instituut (Agricultural Institute) aided by official bodies and private individuals.

A brief account is given of methods of determining the biological value of *Derris*, including Meyer's rapid and economical colorimetric method of estimating the ether extract percentage which (adopting a 20 per cent minimum) was used in the preliminary classification and grading of the individual plants in the heterogeneous material for breeding experiments. The subsequent basis of selection was a minimum rotenone percentage of 9 combined with an ether extract content as high as possible. In this way during 1935-37 over 150 clones with a rotenone content of from 9-14½ per cent were obtained. These clones will now be more rigorously selected for their biological value and also other root characters as well as for resistance to disease and pests.

Crosses have been made between *D. elliptica* and *D. malaccensis* (a form with a low rotenone and a high extract content) and also between *D. elliptica* clones. In 1935 and 1936 the set from natural pollination was very poor in general; no set was obtained in crosses between forms of *D. malaccensis* but crosses between the latter species and *D. elliptica* often gave a high set. A large number of crosses made by Dr Toxopeus have shown that in general *Derris* is extremely heterozygous and much useful material for selection and recombination should be obtainable among the F₂ segregates. An extensive collection of available types is being actively made by the Plantkundig Laboratorium (Plant Laboratory). Cytological observations by Leliveld in 1937 have shown that differences in the percentage of success in hybridization are due to differences in chromosome numbers.

Selection work in which Braak's modification of Gross and Smith's colorimetric method of determining the rotenone and deguelin content of the fresh plants was used, has produced forms of the Toeba Woeloeng variety with from 10-14 per cent (and in some cases even more) rotenone.

Cultural problems (including plot experimentation) are also discussed.

156.

- TOXOPEUS, H. J. 632.951.1-1.524.4(92)
 Over de mogelijke beteekenis van in het wild voorkomende *Derris* voor de
 veredeling van dit gewas; toelichting op een verzoek om medewerking
 bij het verzamelen daarvan. (On the possible significance of wild
 forms of *Derris* for improving the crop; notes on an attempt at
 co-operation in collecting it).

Bergcultures 1938 : 12 : 1042-43.

The need for making a representative live collection of all available wild types is pointed out and the subsequent lines along which breeding work may develop are illustrated by an outline

of the stages whereby wild wheat has been developed to its present state. The inclusion of varied types in the collection is essential in order that the breeder may be in a position to satisfy existing demands or even changed conditions at some future date.

ECONOMIC PLANTS 633

157. FLOOR, J. 633:001.4:578.081

Over het beschrijven van variëteiten. (**Describing varieties**).

Landbouwk. Tijdschr. Wageningen 1937 : 49 : 633-43.

The technique of observations taken with a view to describing or differentiating varieties is fully dealt with from the standpoint of the requirements both in the field and in the test plot. Relevant genetical relationship between varieties should be taken into account.

158. MOGILIVA, A. M. 633:575(47)

(**Breeding and seed production work in the field laboratories in the Nova-Derevnja region**).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 5 : 53-55.

The work of the field laboratories attached to the collective farms is described. Intravarietal crossing has resulted in yield increases of up to 29 per cent in a number of cereals, the crossed plants being more vigorous in growth and tillering capacity and larger in the ear and grain. The method is being applied in a large number of collective farms. It is also being applied to tomatoes.

By mass selection in rye, yield increases varying from 5 per cent to 13·5 per cent have been obtained and similar results have been obtained in millet, where individual plant selection and hybridization are also being applied.

Roguing has been practised in clover and *Nicotiana rustica* and selection for cold resistance in wheat and rye. Large collections of local wild forage plants have been made for use in breeding.

159. IVANOV, N. N. 633:575:581.192

(**The selection of plants on the basis of chemical composition**).

Bull. Acad. Sci. U.R.S.S., Sér. Biol., 1937 : 1801-34.

A study of the variation in chemical composition of any given genus reveals many clear specific differences, e.g. *Lupinus mutabilis* has an oil content of up to 20·5 per cent, while *L. angustifolius* does not exceed 7 per cent; *Solanum andigenum* has a protein content of up to 24 per cent, *S. tuberosum* of only 10 per cent, and the percentage of gossypol in *Gossypium hirsutum* is 1·28 and in *G. herbaceum* 0·15. The actual figures for any compound are influenced by nutritional, climatic and other environmental influences but here again different varieties react differently to favourable and to unfavourable conditions. The length of vegetation period, and the degree of maturity are other important factors influencing the content of such constituents as alkaloids, vitamins, etc. The rate of accumulation or disappearance of various compounds or the conversion of one into another differs in different species.

From the breeding point of view, the quality of the different compounds is of importance—e.g. a corresponding amount of fructose is much sweeter than glucose, different proteins differ in solubility and nutritive capacity, gluten varies in baking quality, starch in speed of hydrolysis. The author describes a number of methods whereby it is now possible to estimate these constituents in small quantities such as plant breeders deal with—e.g. a colorimetric method of estimating alkaloid in lupin seeds without destroying their germinating capacity, similar methods for estimating the oil content of a single seed, and the protein content of seeds. In this way individuals varying in protein content between 21·8 and 35·37 per cent have been detected in the F_2 of a cross American Wonder x Golden peas. Similar differences have been observed between individuals of varieties that morphologically would rank as pure lines. Sweet lupins with seeds varying in protein content from 22·5 to 55·6 per cent have been detected by the above methods and the different types so isolated are being used for breeding. Many of the chemical differences observed in these ways are hereditary and in many crosses cases of heterosis have been observed. Thus the Danish Export tomato contains 26·0 mg.

per cent of vitamin C, San Marzano contains 21.2 and their hybrid 27.6. Again in peppers No. 639 contained 6.0 per cent total sugar and 236.2 mg. per cent vitamin C, No. 298 5.6 per cent sugar and 219.3 mg. per cent vitamin C while their hybrid contained 8.5 and 365.1 respectively. Similar observations on the domestic plum, *Prunus domestica*, have shown it to contain 5.48—13.08 per cent total sugars as compared with 2.84—5.85 per cent in *P. cerasifera*, one of its parents, and 5.90—6.86 in *P. spinosa*, the other parent. The percentage of sucrose in this total sugar was 26.73 in *P. domestica*, 14.22 in *P. cerasifera* and 8.25 in *P. spinosa*. Unripe fruits of *P. domestica* contain appreciable quantities of tannins, and citric acid, but in the ripe fruit both almost entirely disappear. It is probable that by hybridization the desirable characters of other species might be combined, e.g. the high oil content of *Lupinus mutabilis* and the early maturity of *L. pubescens*, and that plant species with more physiologically perfect proteins could be synthesized, etc., etc. A plea is made for the co-operation of biochemists and plant breeders in the solution of such problems.

160. RUBIN, B. 633:577.15:581.192
(Study of the biochemical basis of the variety in cultivated plants).
 Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1938 : No. 4 : 185—93.

Early maturing varieties of cabbage and onion proved to have a higher catalase and saccharase activity while the peroxidase activity was greater in late varieties, in consequence of which their respiration rate was higher; thus the relative activity of the hydrolytic and oxidation processes was reversed in late varieties; the same was true of varieties of good keeping quality. A cabbage variety resistant to *Botrytis* increased its peroxidase activity during attack whilst a susceptible variety did not; the reverse relations held with regard to saccharase. Corresponding differences were observed in the types of sugars; thus onion varieties of good keeping capacity contained principally sucrose whereas poor keeping varieties contained chiefly mono-saccharides; annual varieties were all of this latter type. Similar observations were made in other plants, a more vigorous oxidizing system being observed in late varieties of cabbage and in beets with higher sugar (particularly sucrose) content. Differences of as much as 300 per cent have been observed in peroxidase activity between different strains of cabbage and breeding work has now been started using this as a basis of selection for keeping capacity, etc. The fact that determinations can be made on quite small seedlings suggests that the method might profitably be applied to other plants, in particular fruit trees and other perennial crops.

161. ORLOV, P. G. 633-2.4-1.521.6
(Breeding for the production of varieties of agricultural plants immune to fungous diseases).
 Seleksija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 2 : 28—30.

The stations in the U.S.S.R. equipped for testing the disease resistance of cereals are enumerated and indications are given of the more promising parents to be used in breeding. Promising resistant varieties already produced are also mentioned.

162. IMMER, F. R. 633.00.14(77.6)
The Minnesota system for testing and recommending varieties.
 Proc. Amer. Soc. Sug. Beet Tech. 1938 : 95—97. (Mimeographed).

The system of testing new varieties and of distributing those introduced is described in some detail.

163. RUDORF, W. 633.00.15:575(43)
 10 Jahre Kaiser Wilhelm-Institut für Züchtungsforschung. (**Ten years of the Kaiser Wilhelm Institute for research in breeding**).
 Züchter 1938 : 10 : 225—26.

Ten years ago the new building of the research Institute was opened. The aims and organization of the Institute, which owes so much to the genius of the late Erwin Baur, are briefly described.

164. PESOLA, V. A. 633.00.15:575(47.1)
 Zwanzig Jahre Pflanzenzüchtung in Finnland. (**Twenty years of plant-breeding in Finland**).
 Züchter 1938 : 8 : 216-19.
 A brief account of the organization and work of the Finnish Plant Breeding Institute which was founded in 1918.
 Already new and improved varieties of rye, wheat and peas have been produced.

CEREALS 633.1

165. ROEMER, Th. 633.1-1.521.6:581.142:581.46:575
 Die Züchtung von Auswuchsfestigkeit bei Getreide. (**Breeding for resistance to germination in the ear in cereals**).
 Forschungsdienst 1938 : Sonderheft 10 : 35-38.
 The results of researches on the behaviour of cereals with regard to the habit of germination in the ear are briefly discussed.
 The Argentine variety, Lin Calel, proved to be most resistant to germination in the ear of all the varieties tested and should be a valuable parent for breeding purposes.
 The character can, however, be modified by the locality and by climatic conditions. Varieties resistant to germination in the ear have a reduced diastatic action and for this reason are not liked by millers and bakers. Lin Calel is an exception and presumably it would be possible to produce the combination in other *vulgare* varieties.
 It appears that the factors that determine germination are in the embryo and not in the endosperm.

WHEAT 633.11

166. KOVALEVSKII, L. I. 633.11 Ukrainka:575
 (**The time of production of the variety Ukrainka**).
 Seleksija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 3 : p. 63.
 The author, who participated in the production of the wheat Ukrainka, points out that the work upon it started in 1915 with the selection of ears of the variety Banatka and selection work was continued until 1920 when the new variety was named and released.

167. AVANZI, E. 633.11:575(45)
 Nuove razze di grano in prova. (**New races of wheat on trial**).
 Ital. Agric. 1938 : 75 : 555-60.
 The following five new wheats are described and illustrated, special attention being paid to their baking qualities:—1. Giovanni Emilio Rasetti (Gentile bianco x Ardito, strain 39), 2. Italo Conci (Gentile rosso aristato 13 x Ardito, strain 17.5). 3. Bruno Braschi (Gentile rosso aristato 4 x Ardito strain 7-1). 4 and 5. Races 112 and 114 (from a cross by Marchetti between an unknown wheat and Rieti).

168. GREBENNIKOV, P. E. 633.11:575(47)
 (Main outlines of the work on the breeding and genetics of wheat and barley 1923-34).
 Proc. Agric. Inst. Krasnodar Saratov 1935 : Issue 1 : 3-58.
 After a description of the aims and methods of the breeding work the main achievements are mentioned. These include the production of awnless varieties of *durum* wheat by complex hybridization, some of which are very promising as regards other characters such as yield, disease resistance, earliness, freedom from shedding and quality of grain. The best varieties are described and illustrated. Figures are given showing that the new wheats are in yield and quality equal to the standard awned forms, and experiments with awned forms in which

the awns were removed show that this was without effect on grain yield. Crosses have been made of winter wheat with winter rye; the first generation hybrids, which are described, were intermediate in character, except the ears, which resembled neither parent and were of very low fertility (0·01 to 0·8 per cent.) Wide segregation was observed in the F_2 generation in all characters; some segregates of the *europeum* type were of relatively high fertility. Segregation in the F_3 was not so extreme and most plants were of the wheat type, some of them even spring wheats; several constant families are reported. Great winter-hardiness was observed in some of the F_4 families of intermediate type. The best hybrids are described and illustrated and their yields tabulated, showing that they are of the same order as those of the best standard varieties. Their rust resistance was also satisfactory.

Efforts have been made to produce a winter form of *durum* wheat by crossing the common forms with winter *vulgare*. The F_1 proved to be an "alternative" wheat and varied in fertility from 0·3 to 1·8 per cent. In F_2 a great number of the plants died during the winter, the *vulgare* type being apparently more hardy than the *durum* segregates; when spring sown, segregates that failed to ear occurred in proportions varying from 10 to 50 per cent; there was more sterility in the F_2 than in the F_1 , but occasional fertile plants of a winter *durum* type occurred and the production of an agronomically valuable strain is thought to be a question merely of working on a sufficiently large scale.

Improved winter wheats have also been obtained by crossing the best local and American forms of *T. vulgare*; the best of these, which were superior to Ukrainka in rust resistance, are described and illustrated.

In spring barley, awnless and smooth-awned forms and improved winter barleys have been produced by hybridization; the best forms are described and illustrated. Side by side with the practical breeding work, inheritance studies have also been made, leading to the following conclusions: segregation in interspecific wheat crosses of identical chromosome number is on simple Mendelian lines; dominance is rarely observed in interspecific crosses; attributes characteristic of several other species may appear in segregates from hybrids of two different species; occasional forms of quite high fertility appear in crosses of *T. durum* x *T. vulgare*, and some of them are promising in respect of resistance etc.; *T. vulgare* crosses with rye better than *T. durum* does, the success being entirely dependent on the races used; the rye-wheat F_2 consisted of intermediate or wheat types, with no pure rye types and contained many plants with branched ears; winter forms may segregate from crosses of two spring barleys, especially if they differ in geographical origin and in vegetation period; at least 5-6 genes are concerned in the character "winter habit," all of them recessive but independent of the genes for winter-hardiness; smooth awned wheats appear in certain crosses but in very small numbers, being recessive for a large number of genes.

X-ray treatment of seed produced an increase in yield and earliness and certain mutants were produced in *Phaseolus* but not in wheat and barley.

Wheat races differed in response to phosphatic manuring; also in the time at which the maximum increase of dry weight occurred, in resistance to smut (the most resistant being certain wheat-rye and other hybrids) and in reaction to dense sowing.

A study has been made of the local wheats of the Azov-Black Sea zone and the existing types are described; over 200 races of *T. vulgare* and 140 of *T. durum* were found, the latter including an awnless *durum*.

A full list of the author's papers published in the period under review is given.

169.

KOROBENIKOVA.

633.11:575(47)

(Promising varieties of winter wheat of the Kharkov Breeding Station).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 1 : 18-20.

An account of the aims and work of the Station from 1910-33 including the programme followed for the last few years which includes the crossing of ecological races differing in their reaction to vernalization from Kashgar, China and Western Europe and hybridization to increase winter-hardiness utilizing, among others, forms differing in the length of the vernalization stage.

Another study of the inheritance of winter-hardiness by Professor Delaunay suggests that in the crosses made the character is dominant, and may possibly be due to polymeric factors and that different degrees of reduction in the potency of the controlling genes may exist; the latter hypothesis being based on the discovery, in different allelomorphs, of genes conditioning the character and on the theory of multiple allelomorphs. Delaunay suggests that breeders should select the transgressive (either + or -) forms in breeding for winter-hardiness, while intermediate forms should be eliminated. Hardy forms bred by him are being used for further breeding in 1937-38.

Descriptions are given of promising winter wheats produced at the Station by individual selection from local types or by hybridization.

170. KUČUMOV, P. V. 633.11:575(47)

(**Breeding spring wheat at the Kharkov Station**).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 5 : 35-38.

Mass selection in the variety Arnautka has been successful in producing an improved form with more constant yield. Individual plant selection has produced two improved varieties, Milturum 0162 and Hordeiforme 0802 and promising results are still being obtained with it, especially in connexion with the local wheats.

By hybridization various lines resistant to both *Tilletia* and *Ustilago tritici* have been produced; also several lines of awnless *T. durum*.

Crosses with Garnet have proved promising, particularly in regard to rust resistance. Heterosis has been observed in varying degrees in all *T. durum* hybrids.

171. REZNIKOV, F. 633.11:575(47)

(**A new variety of winter wheat**).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1937 : No. 12 : 26-29.

A white-eared awnless form occurring as an admixture in a red awnless local variety stood out on account of its taller straw and larger ears. Over a period of five years material obtained from this form has yielded an average of 18.5 centners per ha., as compared with 10-12 for the initial red strain. The new form was earlier in maturity and more cold and drought resistant than Durable and not exacting as regards cultural conditions; it has not been attacked by rust or smut and is fairly free from lodging and shedding. The bread produced from it is superior in flavour and texture to that produced from Durable.

172. PESOLA, V. A. 633.11:575(47.1)

Über die Züchtung von Sommerweizen und die Ergebnisse derselben an der Abteilung für Pflanzenzüchtung der Landwirtschaftlichen Versuchsanstalt Jokioinen. Die Kreuzung Marquis x Ruskea. (**The breeding of spring wheat and the results obtained by the department of plant-breeding of the agricultural research station of Jokioinen. The cross Marquis x Ruskea**).

Ber. VI. Kongr. Agron. Baltischen Staaten 1937, 26-29 June : 50-72.

The work was begun in 1918 and the original cross between Marquis and the Finnish wheat, Ruskea, was made in 1921.

The object was to produce an early rust resistant variety, resistant to lodging, high-yielding and with good quality grain. A number of the progeny have proved very promising—Sopu and Hopea are already named and accepted varieties.

The behaviour of these and others of the progeny are compared with the parents and with the Swedish variety, Diamant, as a standard.

173.

*NILSSON, G.

Svalöfs pärlvete. (**Svalöv's pearl wheat**).

Sverig. Utsädesfören. Tidskr. 1938 : 48 : 181-83.

Pearl wheat originates from a cross between the variety 0912 and Svea wheat 1. The new variety, which is described, has been compared in variety trials with standard varieties. It has very stiff straw, good winter-hardiness, high yield and good seed quality.

174.

CARDOSO, C. P.

633.11:575(81)

Genética do trigo e sua influência no melhoramento da lavoura tritícea do país. (**Genetics of wheat and its influence on the improvement of local wheat cultivation**).

Bol. Minist. Agric. Rio de J. 1937 : 26 : Nos 10-12 : 71-93.

The importance of genetical theory, which is briefly outlined, for the wheat industry is emphasized and the use of the methods of individual plant selection and hybridization in wheat improvement is described.

The experiment station at Ponta Grossa has produced an improved wheat variety P.G. 1 which is resistant to rust, yields well and has well formed grains, though their chemical composition still leaves something to be desired. Some of the newer lines are, however, more promising in this respect.

175.

VAZENKO, A. A.

633.11:575.11:581.46

(Inheritance of grey-smoky colour in the ear of *Triticum vulgare* Vill.)

J. Bot. U.R.S.S. 1936 : 21 : 186-88.

Crosses were made between Caesium 0111, characterized by a greyish blue colour of the ears on a red background and a *lutescens* variety with white ears. The F₁ generation resembled the pigmented parent and in F₂ there appeared (1) greyish blue on red background, (2) greyish blue on white background, (3) red and (4) white in the ratio 9 : 3 : 3 : 1. The ratio of coloured to non-coloured was 3 : 1. The data based on a study of the F₃ are presented in tabular form. The two characters are clearly independent.

176.

KUČUMOV, P. V.

633.11:575.12

(The principles of choice of pairs, and work with the first generation of spring wheat at the Kharkov Station).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1937 : No. 12 : 11-14.

The ear emergence of F₂ plants of one cross made on the principle of Lysenko's phasic crossing occurred on dates varying between 11th and 22nd June, while the earlier of the two parents eared on 18th June and the late parent not at all. In another cross the parents eared on 16th and 18th June respectively, the hybrids from 11th to 20th June.

By crossing contrasting ecotypes, hybrids have been obtained which exceeded the parental types in height and in number of grains per ear and per plant.

Interspecific crossing has given rise to a number of promising new lines, especially the cross *T. turgidum* x *T. dicoccum*, and to a lesser extent *T. vulgare* x *T. durum*; from the former cross lines exceeding the standard in yield by as much as 49.6 per cent have been produced.

Complex hybrids have been produced between forms resistant to smut, rust and Hessian fly and promising hybrids are now under observation.

The author is of the opinion that much information on the value of a cross can be obtained from a study of the F₁.

* A translation of this paper is on file at the Bureau.

177.

KASPARYAN, A. S.

633.11:575.127.2

633.11:581.48:576.356.5

Haploids and haplo-diploids among hybrid twin seedlings in wheat.

C.R. (Doklady) Acad. Sci. U.R.S.S. 1938 : 20 : 53-56.

F_1 seeds with twin embryos were found in a number of different interspecific and intervarietal wheat crosses. Seven pairs of seedlings from these were investigated. In three cases both seedlings were normal diploids. In two cases (one in *Triticum durum* and one in *T. vulgare*) one of the seedlings was a haploid. In the remaining two cases one of the seeds was a "haplo-diploid", i.e. had the haploid chromosome number of one parent plus the diploid number of the other. One of these cases was an intervarietal cross in *T. durum*, but the other was an interspecific hybrid *T. vulgare* ♀ ($n = 21$) x *T. armeniacum* ♂ (= *T. dicoccoides* ssp. *armeniacum*, $n = 14$). The abnormal hybrid seedling had 49 chromosomes, and so must have resulted from pairing between a normal egg cell of *T. vulgare* and either a diploid pollen grain or two normal pollen grains of *T. armeniacum*. The latter explanation (polyspermy) is favoured by the author, as, according to him, *T. armeniacum* does not normally form diploid gametes.

The 49-chromosome F_1 plant had 80 per cent normal pollen, and 12 per cent fertility, while the normal 35-chromosome hybrid between the two species was infertile, and its pollen was almost completely sterile.

178.

KOSTOFF, D.

633.11 *T. Timopheevi* :575.127.2:576.354.46

Cytological studies on certain progenies of the hybrid *Triticum Timopheevi* x *Triticum persicum*.

Cytologia, Tokyo 1937 : Fujii Jubilee Vol. : 262-77.

Triticum Timopheevi is peculiar in that it has one genom (the β or G genom) markedly different from the corresponding (B) genom in other tetraploid wheats.

In crosses with *T. persicum*, 10 to 12 bivalents are usual, and the hybrid shows considerable sterility. In the F_2 of this cross, and in crosses of the F_1 with other wheats, certain plants had short chromosomes (monocentric fragments) in the root tip nuclei. In two such plants the fragment was not present in the pollen mother cells. In a third, one fragment occurred and frequently paired with a normal chromosome to give an unequal bivalent. In an F_2 plant with 41 chromosomes, no chromosome fragment or unequal bivalent was apparent at first metaphase, but chromosomes with unequal chromatids were found at first anaphase. These new chromosome types, the author concludes, arose from crossing-over between chromosomes with homologous segments at different distances from the centromere. The importance of this method of modification of the karyotype is discussed, and the occurrence of similar phenomena in *Nicotiana* cited.

Relational coiling of chromatids at mitotic metaphase and in univalents during meiosis is discussed.

179.

JAKIMOVA, E. I.

633.11:575.127.2:576.356.5

Dihaploid hybrids from *Tr. durum* Desf. x *Tr. vulgare* Host.

C.R. (Doklady) Acad. Sci. U.R.S.S. 1938 : 19 : 743-45.

Four 49-chromosome F_1 plants were obtained from the cross *Triticum durum* var. *hordeiforme* x *T. vulgare* var. *erythrospermum*. It is concluded that they arose as a result of the fertilization of an unreduced egg cell of *T. durum* by a normal pollen grain of *T. vulgare*. Fertility in the F_1 was high (2.2 grains per spikelet). The chromosome conjugation at diakinesis was $20_{II} + 9_I$, though it is not stated in how many cells this was observed. The author holds that 14 of the bivalents result from pairing of the 28 chromosomes of *T. durum*, and the other 6 result from autosyndesis in the 21 *T. vulgare* chromosomes.

In F_2 , 12 plants had 21 bivalents and two had 46 chromosomes. It therefore appears that 21-chromosome F_1 gametes are most likely to function. Pollen grains from F_2 plants which were examined, had 26, 22, and (most frequently) 21 chromosomes.

F_3 plants examined had 42, 41 or 40 chromosomes (in 24, 1 and 5 cases respectively).

This demonstrates that a comparatively high number of 20-chromosome gametes function. All the above plants were of the soft wheat type, though segregation for many characters occurred in F_2 and F_3 . Fertility was high throughout.

180.

DERŽAVIN, A.

(Raising perennial wheats and other crops).

Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1938 : No. 1 : 213-19.

In many crop plants the perennial surpass the annual forms in greatly increased and earlier yields in its second, third and fourth year as compared with its first year's output. Many perennial spring crops are also highly frost resistant.

The author's early work with hybrids between wild and cultivated species is mentioned with more recent work on the production of perennial wheat and the problem of eliminating the F_1 sterility in wheat x perennial rye crosses. After 189,000 pollinations, hybrid combinations were chosen which on back-crossing gave a set of 0.01-2.00 per cent. Only a very small proportion of the plants raised from such seed showed normal fertility.

In a cross between Leucurum 1364 I and perennial rye apparently back-crossed to perennial rye two large seeds were obtained of the *Triticum durum* type. One of these seeds produced a normally fertile plant. The hybrid proved to have 42 chromosomes and was therefore an amphidiploid resulting from the union of two unreduced gametes. No back-crossing to the rye had therefore occurred. This plant produced seed in 1933 and twice (summer and winter) in 1934 and 1935, thus indicating a perennial wheat had been obtained. The numerous progenies were resistant to drought and rust, being only slightly attacked by brown rust and not at all by stem or yellow rust; they also showed high yields, e.g. 70 grains per ear with a 1000 grain weight up to 50 grm. The perennial wheat is a vigorous plant which in the second year frequently gives a higher yield and usually ripens 10-15 days earlier than the autumn sowing of the first year. It can also be used for hay, yielding about 1-2 tons per hectare. The second harvest in the year amounts to 50-60 per cent of the first and the 1000 grain weight is 35 grm. The winter-hardiness of the hybrids has been little studied but the winter form survived the 1935-36 winter.

In 1937 a few plants without the defect of fragile ears were selected and the type is to be tested in variety trials.

A coefficient of multiplication of 11,339 has been obtained and, in 1938 it is hoped, 30,000 grains may be obtained from 100 plants from one grain. Spring forms were also found among the hybrids.

Similar investigations are being conducted with perennial hybrids from perennial x annual rye and wild perennial rye plants are also being collected for breeding plants suitable for use as hay.

Work has also been done on perennial vetches (*Vicia cracca* and *Lathyrus* species) and sorghum. Forms of *L. latifolius* with non-splitting pods have been obtained, while perennial sorghum hybrids should prove valuable in view of their normal fertility, great drought resistance, hardiness under poor soil conditions and high coefficient of multiplication.

181.

SCHAD, C. and

HUGUES, P.

Hybrides "blé x seigle". Historique, obtention, stérilité et fertilité de l'hybride F_1 . (Wheat-rye hybrids. History, production, sterility and fertility of the F_1 hybrid).

Ann. Épiphyt. Phytogénét. 1938 : 4 : 235-65.

A review of the method of producing and characteristics of wheat-rye hybrids including the work done at Clermont-Ferrand.

182.

TSCHERMAK von SEYSENEGG, E.

633.11:575.127.5:633.14:576.312

Beiträge zur züchterischen und zytologischen Beurteilung der Weizen-Roggen- und Weizen-Quecken-Bastarde. (Contributions to the genetical and cytological estimation of the wheat-rye and wheat-couch-grass hybrids).

Z. Zücht. 1938 : A 22 : 397-416.

The history of the production of fertile wheat-rye and wheat-*Agropyrum* hybrids by various

workers is briefly reviewed together with an account of their qualities and behaviour. The cytological origin and constitution of the hybrids are then discussed.

These hybrids, which have become fertile and constant by direct and by indirect means, that is by back-crossing with one or other of the parents may, in the author's opinion, be classified into the following four main groups:—

1. Direct, intermediate-constant additive hybrids with complete chromosome addition (e.g. the *Secalotricum* of Müntzing).
2. Indirect additive hybrids brought by back-crossing to fertility and the intermediate constant condition (e.g. the *Secalotricum* of Rimpau and Taylor).
3. Progeny of hybrid origin but without admixture and phenotypically as well as cytologically equivalent to one of the parents (e.g. *Secalotricum* and progeny obtained by Tschermark and by Russian and German workers).
4. Progeny of hybrid origin, but with an admixture of the parent species with the same number of chromosomes as one of the parent species but the genome is not the equivalent of that parent (e.g. the wheat-rye hybrids of Kattermann).

183. BERG, K. H. von and
OEHLER, E.

Untersuchungen über die Cytogenetik amphidiploider Weizen-Roggen-Bastarde. (**Investigations on the cyto-genetics of amphidiploid wheat-rye hybrids.**)

Züchter 1938 : 10 : 226-38.

To provide a basis for future selection a study was made of three wheat-rye hybrids bred at Müncheberg and on the back-cross progeny of some wheat-rye hybrids. Besides their cytological behaviour, details are given of their morphology and fertility.

The majority of the plants were aneuploid with somatic chromosome numbers between 51 and 55. Most of the aneuploid plants with under 54 chromosomes were self-sterile, those above more or less fertile. Euploid plants were also frequently highly sterile.

This sterility is caused by the irregularities of meiosis. As a rule it is impossible to change aneuploid back to euploid and the tendency is for the progeny of the amphidiploids to become atypical; more or less sterile plants tending to chromosome degeneration.

The impossibility of applying the principles of selection to fertility are pointed out.

184. PETERSEN, N. 633.11:575.127.5:633.14:576.312:576.356.5
633.16:576.356.5

Hochchromosomige Gersten, Roggenweizen. (**High chromosome barley, rye-wheat.**)

Wien. landw. Ztg. 1938 : 88 : 147-48.

PETERSEN, N.

Höhere Ernten durch Züchtung von Roggenweizen. (**Higher yields from breeding rye-wheat.**)

Dtsch. landw. Pr. 1938 : 65 : 199, 200.

A brief description of the tetraploid barley produced at Svalöf and a discussion of the value of wheat-rye hybrids for agriculture.

185. SUDNOV, P. E. 633.11:575.127.5:633.14:581.143.26
(**The work of the breeder A. I. Deržavin at the Exhibition.**)
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 7 : 4-5.

The best selections from the hybrids of wheat with perennial rye are now free from sterility and exceed Ukrainka in yield of good plump grain and produce a quantity of herbage which can be used for feeding stock. Forms free from shattering have now been selected. The hybrids are almost equal to Ukrainka in baking quality and excel it in protein content by 2·5 per cent.

Reference is also made to hybrids between perennial rye and perennial sorghum.

186. KATTERMANN, G. 633.11:575.127.5:633.14:581.44:575.061.5
Über konstante, halmbehaarte Stämme aus Weizenroggenbastardierung mit $2n = 42$ Chromosomen. (On constant strains with pubescent stems from wheat-rye crosses with $2n = 42$ chromosomes).
Z. indukt. Abstamm.- u. VererbLehre 1938 : 74 : 354-75.

In continuation of the work already reviewed in "Plant Breeding Abstracts", Vol. VII, Abst. 459, nineteen plants with pubescent stems were examined. The reduction divisions were perfectly normal with 21_{II} in about 94.2 per cent of the pollen mother cells.

The chiasma frequency was statistically investigated and significant differences were found between certain plants. The average number of chiasmata was greater for the paired arms of the open bivalents than for those of the ring bivalents. The chiasma frequency of the B chromosomes was specially studied. There was a marked tendency towards the formation of open bivalents and chiasma frequency was higher both in the rings and open bivalents than in those of the other chromosomes. The behaviour in the hybrids of the pubescence of the stems, set of grain and baking quality was also studied.

A consideration of the results leads to the conclusion that these plants are substitution hybrids, that is, that in the wheat genome one chromosome has been replaced by a rye chromosome.

187. OEHLER, E. 633.11:575.127.5:633.14:581.44:575.11
Untersuchungen über die Behaarung des Halmes in Nachkommenschaften aus Weizen-Roggen-Kreuzungen. (Investigation on the pubescence of the stem in progenies of wheat-rye crosses).
Z. Zücht. 1938 : A 22 : 417-52.

These investigations were made during 1929-36 on various species of wheat and numerous varieties of *T. vulgare* crossed with various forms of rye, as well as on a series of fertile inbred strains of Petkus rye. Only the crosses of rye with *T. vulgare*, *T. Spelta* and *T. compactum* are described. Open-pollinated Petkus winter rye segregated into the approximately 3 : 1 ratio of pubescent and non-pubescent plants. 61.5 per cent of the self-fertile inbred strains of Petkus rye bred true for pubescence. The segregating inbred strains showed the same ratios as the open pollinated variety. The F_1 included 39.6 per cent strongly pubescent, 18.7 per cent weakly pubescent and 41.2 per cent non-pubescent plants.

The behaviour of these various groups is followed in detail up to F_8 .

The pubescent plants were shorter stemmed than the non-pubescent plants.

There was no relation between pubescence of the stem and fertility.

188. GORJUNOV, D. 633.11:575.127.5:633.289
(The *Triticum-Agropyrum* hybrids at the Soviet Agricultural Exhibition).

Seleksija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 6 : 5-7.

Constant hybrids of the annual, wheat type and of various intermediate types, possessed of various advantages such as early maturity, large spikelets with up to 6 grains, large ears and grains, high yield and excellent quality were displayed. Perennial hybrids that have produced six crops during the last three years were also shown; these hybrids all had grain of the wheat type but differed from one another in many other characters. They are free from shattering and lodging and some are resistant to smut.

189. TZITZIN, N. V. (Editor) 633.11:575.127.5:633.289
(The problem of *Triticum-Agropyrum* hybrids).
Ogiz-Selkhozgiz 1937 : Pp. 235.

Under the covers of this volume the information so far available only in scattered papers is brought together for the first time. It is presented in the form of a series of articles, as follows:—

Žigalov, S. A. (The possibilities of form development in *Triticum-Agropyrum* hybrids). (pp. 3-37).

The possibilities and difficulties, of wide crossing in its application to wheat breeding are discussed with reference mainly to the work of the Russian investigators.

Great use is now being made of the fertile *Triticum-Agropyrum* hybrids in pollinating the sterile hybrids and fertile hybrids of other combinations and in back-crossing with the wheat parent. In this way the range of variation in characters in the hybrid populations is greatly increased, and with it the possibilities of producing forms of practical value.

Kikot', I. I. and

Volkova, E. F.

(*Sterility and fertility of Triticum-Agropyrum hybrids*). (pp. 38-60).

Data are given on the set obtained in crosses of different species of *Triticum* and *Agropyrum*. The highest was in *T. durum Plinianum* x *A. elongatum* with a set of 76.3 per cent.; the set in crosses with the 42-chromosome wheat group varied from 0.8 to 73 per cent according to the variety of wheat used. Similarity of chromosome number is certainly not the main factor in determining fertility, and better results were invariably obtained when the wheat parent was used as the maternal parent, even when this had the smaller chromosome number. Some physiological difference between the two genera is thought to account for this phenomenon.

When the F_1 hybrids were back-crossed to the wheat parent most combinations gave the best results with wheat as the maternal parent, though others were better with the hybrid.

The importance in practical work of the difference in success from different varieties is stressed. Different lines of *A. elongatum* also gave varying sets of grain when self-pollinated. Similar differences in set were observed when pollinating a number of wheat varieties with different plants of *A. elongatum*, e.g. variations from 18.8 to 87.9 per cent when different plants were used to pollinate Caesium 0111. The variation was least in the combinations that were the easiest to effect.

The fertility of the F_1 plants of nearly all combinations was greater in the second year than in the first, the plants being perennial.

Some of the fertile F_1 hybrids produced F_2 and succeeding generations consisting entirely of fertile plants.

Ragulin, A. A.

(*On the investigation of the floral biology of Triticum-Agropyrum hybrids and their parents*). (pp. 61-84).

The characteristic flowering habits of the *Agropyrum* and *Triticum* species used in crossing are described in some detail and compared with those of the hybrids. The floral structure of the F_1 hybrids resembles the *Agropyrum* more than the wheat parent. They flower considerably earlier in the second year of vegetation than the first.

Vakar, B. A.

(*Cytology of Triticum-Agropyrum hybrids*). (pp. 85-104).

The F_1 hybrids of *T. vulgare* x *A. elongatum* had varying numbers of bivalents, 14, 21 and 28 being found in different hybrids, which varied also in fertility; these differences are thought to be the consequence of differences in the races of *A. elongatum* used.

In F_1 hybrids of *T. durum* x *A. elongatum* 14 bivalents were generally formed leaving 21 univalents, though in some combinations 21_{II} and 7_I appear, as a result of autosyndesis.

The behaviour of the different types at meiosis is described and the probable homologies of the genomes are indicated.

Crosses with *A. glaucum* indicate that this species has two genomes in common with *T. vulgare* and one in common with *T. durum* but different races exist of this species too, differing in the constitution of their genomes; some of them give hardly any pairing at all in hybrids with wheat.

In the later generations of one of the crosses of *T. vulgare* x *A. elongatum* there occurred certain hybrids with $2n = 56$, some of which formed 28 bivalents.

The close relationship of these two species of *Agropyrum* to the genus *Triticum* indicated by these results is emphasized.

Samsonov, M. M.

(*The problem of grain quality of the Triticum-Agropyrum hybrids*). (pp. 105-32).

A. glaucum and *A. elongatum* have been found to contain gluten of very high quality and in larger quantity than in wheat grains and the same applies to the hybrids, which produce bread of excellent quality and a special, pleasant flavour.

Udol'skaja, N.L.

(Production of drought resistant forms of *Triticum-Agropyrum* hybrids). (pp. 133-64).

Drought resistance is not an absolute attribute but the reaction of varieties varies with growth conditions, time of incidence of drought, etc., etc. One biotype is drought resistant at the tillering stage but susceptible at earing, another is resistant at earing and susceptible at tillering; these biotypes are suited to quite different climatic regions.

Laboratory and field tests were made on a number of the *Triticum-Agropyrum* hybrids of different generations. The F_1 's, which resembled *Agropyrum*, were very drought resistant; at whatever time the drought occurred growth was suspended and new tillers were formed immediately the water supply was restored. The *A. glaucum* hybrids tended to be less resistant than those of *A. elongatum* and the progenies of different parental strains differed in their precise degree of resistance.

The F_2 hybrids obtained by back-crossing with wheat varied in reaction to drought and some particularly promising plants have been selected. They varied widely in time of maturity too, the hybrids (*Sarrubra* x *A. glaucum*) x *Sarrubra* being the earliest.

The hybrids of later generations were nearly all damaged by early drought though several of them proved quite resistant to late drought. One F_4 hybrid, however, No. 34085 from (*Lutescens* 062 x *A. glaucum*) x *Kooperatorka*, after two successive drought periods in the tillering stage fully retained its viability and gave a yield of grain, whilst *Milturum* 0321 under the same conditions was killed. An F_3 hybrid (*Lutescens* 062 x *A. glaucum*) x *Lutescens* 062 was equally resistant. Many lines that appeared uniform segregated with regard to drought resistance when subjected to these rigorous conditions, and their application is the best means of selecting the most resistant plants.

The loss of water during drought was less in the resistant hybrids than in susceptible varieties, the water loss being particularly low in hybrid 34085. The rate of water loss from detached leaves was also less. The osmotic pressure of the leaves rose more during drought in this hybrid. It is also characterized by an unusual vigour of assimilation immediately after a period of drought. All the resistant hybrids had much longer root systems than the common wheat varieties.

Representatives of both the first and second types of drought resistance referred to above were found among the hybrids and they were found to differ in a series of characters, both morphological and physiological. Back-crossing with *Lutescens* 062 tends to produce segregates of the second type but crossing with winter wheats produces some extremely promising drought-resistant types, showing the influence of phasic development on drought resistance.

Blinkova, M. V.

(Winter-hardiness of the *Triticum-Agropyrum* hybrids). (pp. 165-204).

In order to study the causes of winter injury, plants were examined once a fortnight throughout three consecutive winters at Omsk. The main loss of plants occurred in the spring when the snow was melting and extreme changes of temperature occurred. Figures are given showing that the amount of sugars accumulating during autumn hardening is greater in hardy varieties than in susceptible and the reduction in water content is more pronounced. This was most marked in *Agropyrum*, which is the hardest of the cereals tested. The temperature of coagulation of the proteins is also higher for the hardier varieties and the loss of sugar during the winter is least, *Agropyrum* having been found to have quite a considerable sugar content at the end of the winter. Accordingly it was possible to detect a higher rate of respiration in the susceptible than the hardy varieties, the lowest respiration in the winter months being found in *A. elongatum*.

Examination of the *Triticum-Agropyrum* hybrids showed that they had inherited the peculiarities of the *Agropyrum* parent; they displayed a more vigorous assimilation system, a much lower rate of nocturnal waste, a marked difference in colour between the young and old leaves, which permits assimilation to continue throughout the day—in weak light by the dark leaves and in full light by the paler leaves; some forms reach a sugar content of 21 per cent and over at 3 p.m. The individual hybrids varied and some were even better than *Agropyrum* in the above respects. The temperature of coagulation of the proteins in water extract

at the end of the winter was 72–75° C. for hybrid Lutescens 062 x *A. glaucum* as compared with 62–71° C. for *A. elongatum* and 57° C. for Lutescens 0329; in *A. elongatum* and Lutescens 062 x *A. elongatum* at the beginning of the frosts no proteins were obtained in the water extract, the proteins having been transformed into an insoluble form. Such plants need a much shorter period of hardening to acquire resistance than do the common winter cereals. Hybrids of a similar type were observed in the F₂ and later generations. These were the plants with a long thermo-stage, with delayed ear emergence; it is thought therefore that phasic development is closely bound up with the changes in the properties of the proteins.

Malakhov, I. I. (*On the carbohydrate content of the stolons of A. repens*). (pp. 205–07).

Analyses of the stolons were made throughout the vegetation period and showed that the dry matter content rose consistently throughout, leaving a large supply of nutrient materials for the winter and following spring. A similar rise was observed in the content of starch. The soluble sugars decreased until flowering, after which they rose to as much as 41·67 per cent.

Muraškinskii, K. E. (*Tilletia controversa in the Altai foothills*). (pp. 207–10).

Specimens of *A. repens* attacked by *T. controversa* are described.

Ljubimova, V. F. (*A Secale-Agropyrum hybrid*). (pp. 211–23).

One hundred and twelve flowers of Vyatka rye were pollinated with *A. glaucum* var. *genuinum*, producing ten hybrid grains, which gave rise to six plants. They were all sterile but exceptionally frost resistant and perennial in habit; in other characters the hybrids were intermediate, the *Agropyrum* characters tending to dominate. The morphological features of the hybrid are described in detail. No set was obtained by pollinating with the parental species.

The somatic chromosome number was 28 (7 rye + 21 *A. glaucum*); only 3–4 bivalents were present at meiosis and the meiotic irregularities are described; these include the omission of the second division resulting in dyad formation; triads, pentads and hexads were also formed. Occasional well formed pollen grains were also observed and it is thought that by working on a larger scale partial fertility might be attained.

The high degree of sterility of this hybrid is a further confirmation of the close relationship of the genera *Triticum* and *Agropyrum*.

190. VALUTĂ, Gh. 633.11:575.127.5:633.289
Hibrizii grâu x pir. (**Hybrids of wheat x couch grass**).
 Viața Agric. 1938 : 29 : 144–47.

A review of the work of N. V. Tzitzin on wheat x *Agropyrum* hybrids.

191. WERUSCHKIN, S. M. 633.11:575.127.5:633.289
(The relationship between the genera Agropyrum and Triticum).
 J. Bot. U.R.S.S. 1936 : 21 : 176–85. 633.1:582

The bearing of the new genetical and cytological data upon the systematic relationships of the two genera and their hybrids is discussed. It is clear that a certain group of *Agropyrum* species is closely allied to *Triticum* on the one hand and to *Aegilops* on the other; hybrids between *Agropyrum* and rye have also been produced.

The author is in favour of separating the group of *Agropyrum* species concerned into a separate genus. The centre of diversity of the genus coincides broadly with that of the genera *Triticum* and *Aegilops*.

Some forms of *A. cristatum* (subgenus *Eu-agropyrum*) cross with *T. Timopheevi* and with *Secale cereale*. The genus *Roegneria* however, has entirely failed to cross with either *Triticum* or *Secale*.

On the basis of these data a revised division of the tribe *Hordeae* is proposed and a list is given of the known intergeneric crosses.

192. KIHARA, H. and
NISHIYAMA, I. 633.11:575.127.5:633.289:576.356.5
Possibility of crossing-over between semihomologous chromosomes from two different genomes.

Cytologia, Tokyo 1937 : Fujii Jubilee Vol. : 654-66.

The hybrid *Triticum polonicum* x *Haynaldia villosa* shows 0-4 bivalents in the F₁ reduction division. Some of these must arise from pairing between partly homologous chromosomes of the A (or B) and V genomes.

When back-crossed to *polonicum*, the triploid hybrid gives pentaploid, and hypo- and hyper-pentaploid offspring. These result from the formation of restitution nuclei with or without extra micronuclei in the F₁ pollen mother cells. Some back-cross plants give 14_n + 7_i regularly, others have frequent trivalents and quadrivalents. These configurations are considered to be due to crossing-over between partly homologous chromosomes of the A (or B) and V genomes in the F₁, giving in the back-cross chromosomes with parts homologous with parts of at least two others. Such complex-forming plants give deficient gametes and are markedly sterile. Plants not containing these complexes behave in subsequent generations like normal pentaploid wheat hybrids.

193. THOMPSON, W. P. and
THOMPSON, M. G. 633.11:576.356.2:581.162.5
Reciprocal chromosome translocations without semi-sterility.

Cytologia, Tokyo 1937 : Fujii Jubilee Vol. : 336-42.

Three different reciprocal translocations produced by radiation in *Triticum monococcum* and two in *T. durum* were studied. In each case, ovule and pollen sterility were only slightly increased by the presence of the translocation, there being usually 5 to 10 per cent sterility in the ring-forming plants, and 1 to 3 per cent in their normal sibs.

This condition was found to be due to the fact that the ring or chain of four chromosomes nearly always segregates in a regular zigzag (disjunctional) manner.

194. DERŽAVIN, A. I. 633.11:581.143.26
(**Summary of work with perennial wheat in 1937**).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1937 : No. 12 : 14-15.

The perennial wheats are proving quite winter-hardy, and are superior to the standard Ukrainka in such qualities as vigour of growth, height and strength of straw, number of spikelets per ear and size of ear (twice that of Ukrainka in the second year of growth) and rust resistance. They were four days later in maturity than Ukrainka. Some individuals shattered rather badly when over-ripe and were therefore discarded; out of 300,000 plants six were found with ears absolutely free from shattering, thereby removing one of the main defects of the perennial wheats. Many plants gave a second yield of grain later in the season.

195. EBIKO, K. 633.11:581.143.26:575.11
Inheritance of growth curve.
J. Amer. Soc. Agron. 1938 : 30 : 558-63.

Robertson's growth equation $\log x/(A-x) = K(t-t_1)$ was used in this investigation, the measure of growth being plant height. In the equation x is the amount of growth in time t , A the maximum degree of growth attained, K a constant and t_1 the time when $x = A/2$.

The two varieties of spring wheat used gave 0.0377 and 0.0406 for K , respectively. Reciprocal F₁ hybrids between them both gave $K = 0.0395$. In F₂ transgressive segregation for the value of K was observed and this was confirmed in F₃. It is inferred that the constant K , which determines the slope of the growth curve, is inherited on a multiple factor basis.

196. GREEBENNIKOV, P. E. 633.11:581.46:575.127.2:575.11
(**On the question of the origin of smooth-awned wheats**).
Proc. Agric. Inst. Krasnodar 1935 : Issue 1 : 59-64.

One plant with smooth awns occurred in the F₂ progenies of 2 out of 180 interspecific combinations; both were representatives of the cross *T. durum* x *T. turgidum* and other families of this

combination produced smooth awned plants in F_3 ; they occurred in the ratio 1 : 63 and 1 : 255 in different families, suggesting the operation of not less than four genes. In crosses with normals these plants all produced normal F_1 s and in crosses with other smooth awned plants the F_1 was usually smooth; in crosses with normal, segregation of various degrees of complication occurred in F_2 ; some crosses between two smooth awned plants produced in F_1 and F_2 generations with somewhat rough awns.

197. JAKUBTSINER, M. M. 633.11-1.524.4(47)

(**Available species in local wheats of the Union**).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 1 : 20-22; No. 4 : 37-40.

Some notes on species and types of soft wheats and of 28-chromosome wheats represented in the old local wheats of the Soviet Union.

198. KUČUMOV, P. V. and 633.11-1.524.4(47)

KAPLAN, N. M.

(**A valuable new local variety of spring wheat**).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 2 : p. 21.

The local land races, the authors submit, have been neglected by breeders, and data are given regarding one of them, No. 9423 from the Kharkov region, which yielded 11 per cent more than the recommended pedigree varieties during the period 1935-37. It is early in maturing and of good grain quality. Selections are now being made from it.

199. KURKIN, M. P. 633.11-1.524.4(47)

(**Local wheats of the mountainous region of Badakshan**).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 4 : 41-43.

The wheats of this area belong to two species, *Triticum vulgare* and *T. compactum*. The main areas under wheat are 1700-2800 metres above sea level. The wheats grown are populations comprising from 8-10 botanical varieties, with one or two predominating in the population. Awned forms are considerably more numerous than unawned ones and most of the wheats are of the *sub-rigidum* type.

The seven forms most widely grown are described and the quality of the grain of Badakshan wheats and their milling and baking value are considered.

200. JAKUBZINER, M. M. 633.11-1.524.4:575(47)

(**The varietal wealth of local wheats in the Soviet Union**).

Sotsialistčeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1938 : No. 6 : 111-21.

An account is given of the general characteristics of the local Russian populations of *T. durum*, *T. turgidum*, *T. vulgare* spring and winter groups, *T. Timopheevi* and other species, with indications of the value of certain forms for breeding, the use that has already been made of them, the varieties to which they have given origin and their main defects. The local names are applied almost invariably to mixed local populations and many of them, such as Kubanka (*T. durum*), Poltavka (*T. vulgare* var. *lutescens*) etc. have given rise to a great number of distinct varieties by selection. Indications are given of the types most promising for breeding for disease resistance, resistance to shedding, lodging, frost and germination in the sheaf, for earliness, size of grain, high number of grains per spikelet, for northern conditions and for irrigated conditions.

201. ČERNOMAZ, P. A. 633.11-1.547.2:575

(**Variation of external characters of crop plants under the influence of the application of intensive agronomic measures**).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 4 : 30-33.

It was noted that over 50 per cent of winter wheat plants grown under very good agronomic conditions developed a second tillering node, a feature which should, it is believed, be

accompanied by an increased number of ears. It is quite probable that this characteristic may be heritable under good agronomic conditions and, if this is so, selection for it could be practised.

Among plants of the wheat variety Moscow 02411, a branching of the ear different from that found in ears of *Triticum turgidum* or *T. Vavilovianum* occurred in ten instances. On the protuberances on the middle portion of the rachis there were several spikelets which were each disposed on a rachilla arising from the protuberance on the ear. At the base of the rachis were two large glumes and higher up on the rachilla another series of spikelets comprising two or three florets. The inheritance of these characters is being tested. Examples of increased branching in millet and increased height and number of cobs in maize are also cited as the results of good cultivation and the possibility of fixing such characters in the progeny is suggested.

202. KONTAR, E. S. 633.11-2.111-1.521.6
(New varieties of sugar beet from the Ivanov Breeding Station). 633.41:575(47)
 Seleksija i Semenovodstvo (Breeding and Seed Growing) 1937 : No. 12 : 32-33.

The Ivanov station has produced some very high yielding sugar beets; also wheats, the newest, No. 2119, giving 5 centners per ha. more than Ukrainka; it is very hardy, having originated from a plant selected from a local hybrid population on account of its being one of the few survivors after a very severe winter.

203. MEDVEDEV, G. M. 633.11-2.111-1.521.6:575.12
(The method of choice of parental pairs in winter wheat in crossing for winter-hardiness).
 Seleksija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 6 : 20-22.

By removing plants from the field into the greenhouse at 10 day intervals it was possible to determine the length of their thermo-stage; some varieties needed much longer in the open than others. The varieties with the longest thermo-stage tended to be the most hardy, though a certain group of varieties with a short stage proved unexpectedly hardy and it is proposed that representatives of the two groups should be intercrossed, in the anticipation that hybrids exceeding both parents in frost resistance would be produced. A list of the promising varietal combinations is given.

204. NIZEN'KOV, N. P. 633.11-2.111-1.521.6:578.081
(A new method of determining the frost resistance of varieties of winter wheat).
 Seleksija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 1 : 16-18.

The author claims to have discovered a more rapid and reliable means of determining frost resistance than existing methods. The new process consists in measuring the electro-motive force in the experimental plant with a galvanometer. This force is conditioned by the unfrozen water present, the electrolytes in the cell sap and the temperature of the plant, the first two factors being invariably inter-dependent. By these three factors the colloidal properties of the plant protoplasm—the main basis of winter-hardiness—are determined.

Using a standard scale for winter-hardiness evolved by V. Ja. Jur'ev and his colleagues at the Kharkov Experiment Station, the new technique was tested with four varieties of wheat; and even allowing for different prevailing temperatures, varietal differences in electro-motive force were maintained throughout the test, though admittedly there was a considerable range of variation within the separate varieties. Corresponding differences were found in the grain. Experiments with 30 varieties of winter wheat were made and the resulting groupings into low, average and high winter-hardiness were confirmed by the results from direct freezing in the cold chamber.

The method is valuable also for distinguishing new, more winter-hardy forms within pure

lines and in general has the advantage of simplicity and of not injuring any new valuable forms among the plants tested. Moreover the process can be carried out at any suitable moment in the vegetation period and can be also applied to grain.

205. STEFANOVSKII, I. A. 633.11-2.112-1.521.6
(The role of the reproductive organs in drought resistance of spring wheats).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 3 : 23-27.

Data are presented showing that the most critical period as far as drought is concerned is from stem elongation to ear emergence. One of the effects of drought is to reduce the number of grains per ear by damage done to the floral organs. Varieties differed in the degree of this damage under given conditions. They differ also in the rate at which the grain fills, rapid filling being essential for arid regions.

206. UDOL'SKAJA, N. L. 633.11-2.112-1.521.6:575
(Drought resistance of spring wheat varieties).
Omgiz, Omsk 1936 : Pp. 124.

After a brief introduction on the present state of research on drought resistance, questions of technique are treated at some length with reference to pot experimentation and determination of drought resistance. The performance of spring wheat varieties tested for resistance from 1927-35 is summarized. The relation of various physiological phenomena in spring wheats to drought resistance is examined, and also features indicative of resistance to damage by sand storms.

As regards the possibility of using morphological characters in breeding for resistance, experimental data are cited to show the relation between certain characters and the reaction of the wheat plants to drought, and a scale of criteria is drawn up for future observational work on varieties. In the type of reaction to drought two different biotypes are distinguished. The breeder should aim to improve both types and to obtain increased yield as well.

General suggestions are made on procedure in breeding for and determining drought resistance with theoretical considerations on physiological aspects of drought injury and factors conditioning resistance.

Descriptions are given of wheat varieties distributed in various regions of the U.S.S.R. A bibliography, mainly of Russian papers, is appended.

207. VOGEL, O. A. 633.11-2.183-1.521.6:581.46
The relation of lignification of the outer glume to resistance to shattering in wheat.

J. Amer. Soc. Agron. 1938 : 30 : 599-603.

The proportion of lignified tissue at the breaking point of the outer glumes was greater in varieties resistant to shattering. Minor differences in resistance to shattering could not be distinguished by this method because of variability among individual glumes and it is suggested that a direct measurement of the tenacity of mature glumes would be a more useful indication of resistance to shattering.

208. KOSTOFF, D. 633.11-2.4-1.521.6:575.127.2
***Triticum Timococcum*, the most immune wheat experimentally produced.**

Chronica Botanica 1938 : 4 : 213-14.

The immunity to fungous diseases characteristic of the species *Triticum Timopheevi* and *T. monococcum* is very difficult to transfer to *T. vulgare*, as the hybrids obtained are usually self-sterile.

The author has now produced the amphidiploid *T. Timopheevi* x *monococcum* ($2n = 42$), by chromosome duplication in the F_1 hybrid. This has proved completely immune to all fungous diseases in the nursery, and artificial infection with rusts has proved impossible. The amphidiploid (which has been called *T. Timococcum*) is thus very promising parent material for breeding immune wheats.

209. GYLAND, K. 633.11-2.42-1.521.6:575
 Höhere Erträge durch Züchtung mehltauresistenter Sorten. (**Higher yields by breeding varieties resistant to mildew**).
 Dtsch. landw. Pr. 1938 : 65 : p. 288.
 Report of the work of Professor Vik already reviewed in "Plant Breeding Abstracts", Vol. VIII, Abst. 1166.

210. ROSENSTIEL, K. VON 633.11-2.42-1.521.6:575
 Untersuchungen über den Weizenmeltau *Erysiphe graminis tritici* (D.C.), siene physiologische Spezialisierung sowie die züchterischen Möglichkeiten seiner Bekämpfung. [**Investigations on the wheat mildew *E. graminis tritici* (D.C.), its physiological specialization and the possibilities of breeding for its control**].
 Züchter 1938 : 10 : 247-55.

Six populations of the fungus were identified and tested. The reactions of a number of wheat varieties and species are tabulated—grouped according to their resistance to 6, 5, 4, 3, 2 or 1 populations.

The resistance of the 7 and 14 chromosome wheat species to a large number of the populations was greater than that of the 21 chromosome species. A table shows the reaction of the F₂ of crosses between resistant and susceptible species.

211. JOHNSTON, C. O., 633.11-2.452-1.521.6(73)
 MELCHERS, L. E. and 633.11 Early Blackhull
 MILLER, J. O.
The wheat stem rust epidemic of 1937 in Kansas.
 Plant Dis. Reporter 1938 : Suppl. 107 : 83-94.

Details are given of the extent and severity of the 1937 wheat stem rust epidemic in Kansas, together with meteorological data for the months of May and June.

The reactions of the main varieties of wheat grown in the state are described. In general, soft red winter wheats were more heavily infected than hard red winter varieties. Early Blackhull showed the lowest infection, partly owing to its earliness, which enables it to escape the epidemic to some extent. This variety also seems to have some real resistance, since infection was relatively low even in late sowings.

212. CHRISTIANSEN-WENIGER, F. 633.11:664.641.016(49.6)
 Das Problem des Qualitätsweizens in der Türkei. (**The problem of quality wheat in Turkey**).
 Züchter 1938 : 8 : 201-10.

A high standard is demanded for wheat exported into Europe and the problem for Turkey is the production of hard and soft wheats to meet the demand.

The results of an investigation of pure line varieties of *vulgare* and *durum* wheats grown in various districts of Turkey showed that there was very considerable variation in the quality of the soft wheat. Only in certain districts was the quality consistently up to standard. With *Triticum durum*, in practically every case, the value was above standard. Only mechanical methods are needed for its improvement.

213. BERLINER, E. 633.11:664.641.016:575
 Über die Beziehungen zwischen Klebergehalt und Kleberbeschaffenheit im einzelnen Weizenkorn und bei den Weizenrassen. (**On the relations between gluten content and gluten quality in individual wheat grains and in wheat races**).
 Mühlenlaboratorium 1938 : 7 : 81-86.

Wheat varieties may be rich or poor in gluten or possess strong or weak gluten. If the amount and quality of the gluten are inheritable characters of certain varieties of wheat, it may be possible for the breeder to combine them in one variety.

214. GLIEMEROTH, G. 633.11:664.641.016:575.11
 Beiträge zur Genetik der Weizenqualität. (**Contributions to the genetics of quality in wheat**).
 J. Landw. 1938 : 86 : 89–113.

Crosses were made between three winter and four spring varieties of wheat of different baking quality. Lohmann's Kolben represented the highest A-quality; Yeoman II and Rimpaus früher Bastard, B-quality; Carsten V, Ebersbacher weiss and v. Rümkers früher Sommer-Dickkopf, a low C-quality, and Strubes roter Schlanstedter a higher C-quality.

The Göttinger micro-method was used for the estimation of quality.

The test number is considered to be the most suitable character of quality as it is mainly due to gluten quality. The varieties used were found to be not pure lines and the quality could, to a certain extent, be improved by selection. Crosses were made between Lohmann's Kolben and the three varieties with the lowest C-quality and between the varieties with more similar quality. An analysis of the progeny of F_3 and F_4 showed that several factors are involved in the genetical constitution of baking quality and that only a very limited number of non-segregating plants of good quality are to be expected.

The possibility of breeding good quality wheats with a high yield was confirmed and also it was shown that transgression in the direction of good quality occurs in crosses between low quality varieties.

215. BOGUSLAWSKI, E. VON 633.11.00.14-1.8
 Die Sortenleistung in Abhängigkeit von der Düngung und dem Stickstoff/Kaliverhältnis in der Düngung. Untersuchungen bei Winter- und Sommerweizen. (**The dependence of varietal capacity on manuring and the nitrogen/potassium ratio in the manure. Investigations with winter and spring wheat**).

J. Landw. Jb. 1938 : 86 : 207–44.

The reaction to manuring was found to be a varietal characteristic. For other physiological characters such as the developmental rhythm, utilization of water etc., the reaction between genetically conditioned varietal characters and nutritional factors was investigated.

216. IWATA, K. 633.11 *Aegilops*:575.12:576.312
 (Karyo-genetical investigations on the hybrids between varieties of the species *Ae. triuncialis*).
 Jap. J. Genet. 1938 : 14 : 159–71.

The crosses were between the varieties of *Ae. triuncialis* ssp. *eu-triuncialis* Eig. *typica* x *hispida*, *typica* x *glauca* and *hispida* x *glauca* and all the F_1 progeny showed heterosis. In the F_1 and F_2 of the cross *hispida* x *glauca* meiosis was regular. Irregularities were more frequent in the meiosis of the F_1 of the other two crosses.

The character absence of waxy bloom was dominant over its presence. The segregation showed a 13:3 ratio. An inhibiting gene is probably present.

BUCKWHEAT 633.12

217. ŠUBINA, A. F. 633.12:575.12
 (An experiment on crossing buckwheat).
 Seleksija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 6 : 27–29.

The floral biology and method of crossing in buckwheat are described. Crosses were made involving a number of different combinations of parents and the results are tabulated. The set was very much better when short styled forms were crossed with long styled and *vice versa*, rather than when two plants of the same type were crossed.

218. KOPEL'KIEVSKII, G. V. 633.12-1.524.4(47)
(Speed up the testing of local varieties of buckwheat).
 Seleksiya i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 6 : 29-31.
 A study of the local population of buckwheat in respect of yield, time of maturity, flower extraction etc. showed some of them to be equal to the standard variety Bogatyr' and to be worthy of considerable attention as initial breeding material. Mass selection is the method of improvement adopted.

OATS 633.13

219. *GRANHALL, I. 633.13(48.5)
Studier över svensk lanthavre. I. Historik, beskrivning av huvudtyperna samt undersökningar rörande mångformigheten. (Studies on Swedish land oats. I. History, description of the principal types and investigations on the multiplicity of forms).
 Sverig. Utsädesforen. Tidskr. 1938 : 48 : 63-110, 111-51.
 An investigation of the land races of oats of Sweden and its neighbouring countries. A detailed analysis of the biotypes of three populations of land oats was undertaken. Altogether 15 characters were analysed and the work shows the existence of numerous forms, the result of ecological factors and of methods of cultivation, some of them of value for breeding.

220. MORAIS, A. T. DE 633.13:001.4
Qu'est-ce qu'Avena agraria Brot., son individualité et les formes voisines. (What is *A. agraria* Brot., its individuality and related forms).
 Bol. Soc. Broteriana 1937 : 12 : 2nd Sér. : 225-50.
A. agraria was described in 1804 by Professor Brotero of Coimbra and distinguished by him from *A. sativa* L. and from *A. strigosa* Schreb. Subsequent workers have been unable to make the distinction.
 The author, while studying the oats of the district where Brotero worked, has found an oat differing from *A. strigosa* Schreb. and from *A. brevis* Roth. and which he identifies as *A. agraria* Brot.
 The new form is described and its connexion with related species is discussed. *A. agraria* and the closely related *A. Mandoniana*, taxonomically considered, are only sub-species of *A. strigosa* Schreb. s.str. A table gives a general view of the differential characters of the five sub-species, including all the known forms of *A. strigosa*.

221. 633.13:575(75.6)
New strain of oats.
 Ext. Fm-News, Raleigh, N.C. 1938 : 24 : p. 2.
 The new oat variety, Lee No. 5, now released to farmers, was bred from the cross Winter Turf x Aurora. It combines the winter-hardiness of the former with the good grain qualities of the Aurora variety, and also yields well.

222. EMME, H. 633.13:575.127.2:575.11
(Genetical investigation of 14 and 28 chromosome oats).
 Biologičeskii Žurnal (Biologicheskij Zhurnal) 1938 : 7 : 69-90.
 Hybrids between the 14 chromosome oats *A. strigosa* ssp. *strigosa*, prol. *brevis*, ssp. *hirtula* and prol. *nuda* were almost fully fertile, those between 28 chromosome subspecies *barbata*, *abyssinica*, *Vaviloviana* slightly reduced in fertility and hybrids between the two groups were of very low fertility, the grains produced being of inferior germinating capacity. The literature on the inheritance of a number of characters in such crossings is examined and the results tabulated.

* A full translation of this paper is on file at the Bureau.

The present results are then discussed in detail. Firstly the cross ssp. *hirtula* (Lag.) Malz. x ssp. *strigosa* Schreb. s.str. and ssp. *hirtula* (Lag.) Malz. and prol. *brevis* (Roth) Thell. The various characteristics of this group of species and of the present hybrids are tabulated. The F_1 plants were large and healthy and formed abundant grain, up to 600 and more per plant; the characters of *hirtula* were almost entirely dominant, except in the habit of the young plants, which was intermediate. The F_2 plants were somewhat less luxuriant and their yield of grain was lower. There occurred plants having florets of four types, (1) *hirtula* type, (2) *subhirtula* type, (3) *intermedia* and (4) *strigosa* (or *brevis*) type, in proportions corresponding to a dihybrid ratio and it is assumed that *hirtula*, in addition to the main gene *H*, contains a modifier *M*, both being required to produce the *hirtula* base. As regards the type of base of the second floret, plants of the *hirtula*, intermediate and *brevis* (or *strigosa*) types occurred in the ratio 9 : 3 : 4, the first, articulated, type occurring always when the first floret is articulated (*hirtula* type). The flowering glume of the first floret was either pubescent along its entire length or only at the base of the awn, the two types appearing in the ratio 3 : 1; a gene of the series *H-h* is assumed to be responsible. In the *brevis* F_2 , however, a certain number of entirely glabrous forms also appeared, also in a monohybrid ratio; these are thought to be plants lacking the basal gene *H*. The pubescence in the second floret in nearly every case corresponded to that in the first. The pubescence at the base of the first floret was absent in only very few F_2 segregates and none appeared without pubescence on the second floret; monohybrid segregation occurred for its distribution — along the whole length or at the base alone.

In the cross ssp. *hirtula* (Lag.) Malz. x ssp. *barbata* (Pott.) Thell. only one plant, with $2n = 21$, was obtained; all its seeds were inviable. Similarly ssp. *abyssinica* (Hochst) Thell. x ssp. *hirtula* (Lag.) Malz. gave only one hybrid, with $2n = 21$; it resembled *hirtula* in every respect except its complete sterility.

The hybrids ssp. *abyssinica* x ssp. *Vaviloviana* Malz. resembled the latter species. The F_2 plants all had sparse pubescence at the base of the awn of the first and second florets and no segregation occurred in awn characters either. Segregation occurred for awn colour and type of floret, there being 17 of the type *Vaviloviana* and 11 of the type *abyssinica*, which is interpreted as a dihybrid ratio. The second floret usually corresponds to the first except that in certain individuals in which the first is intermediate the second is quite firmly attached. These two species are clearly and closely related.

Hybrids ssp. *abyssinica* (Hochst) Thell. x ssp. *barbata* (Pott) Thell. were almost indistinguishable from *barbata* except in their semi-erect habit. The F_1 was somewhat reduced in fertility. In F_2 there appeared only about three plants with sparse pubescence and floret base of the type *abyssinica* in a family of 70; this is possibly a dihybrid difference. These hybrids, differing in only a few characters, form a bridge between the East African and Transcaucasian groups of 28 chromosome species.

An examination of the chromosome morphology of the *barbata* group and the *strigosa-brevis-nuda* group showed them to be identical and this is a further proof of the close relationship of the two groups, and all the species of this cycle are thought to have originated from an ancestor of the *hirtula* type. The relationship between *Vaviloviana* and *abyssinica* is also confirmed karyotypically and this group, as well as *barbata*, is also thought to be derived from *hirtula*.

223. MORAIS, A. T. de
Les hybrides naturels d'*Avena sativa* L. (The natural hybrids of
A. sativa L.).
Bol. Soc. Broteriana 1937 : 12 : 2nd Sér. : 253–86.

Seed of *A. sativa* L. var. *subuniflora* (Trab.) Malz. sown in 1931 gave rise to a plant of which the florets differed from those of the other plants in having long and not very dense pubescence on the flowering glume of the first flower. Eight grains of this plant were sown and produced progeny which as regards the florets showed forms of *A. sterilis* L. s.str. var. *scabriuscula* (Perez-Lara) Thell., of *A. sterilis* L. s.str. var. *calvescens* Trab. et Thell., forms resembling the immediate parent and others like the original *A. sativa* L. var. *subuniflora*. The results are compared with those of Florell (Cf. "Plant Breeding Abstracts", Vol. II, Abst. 232) and it

is assumed that the variant plant was the result of a natural cross between *A. sativa* and *A. sterilis*. Seed from the plants resembling the *A. sativa* x *A. sterilis* hybrid gave plants like the hybrid parent. Among the progeny of this hybrid form there appeared in 1933 a plant with black glumes. Seed from this plant gave, among its progeny, three phenotypes, as distinguished by their florets.

1. *A. fatua* L. s.str. var. *pilosissima* S. A. Gray.
2. *A. sativa* x *sterilis* Tab. Mor.
3. *A. fatua* x *sativa* x *sterilis*.

The theoretical basis for supposing these also to be the result of a natural cross with *A. fatua* and the reasons for the constancy of the progeny of the *sativa* x *sterilis* hybrid are discussed.

224. MORAIS, A. T. de 633.13:575.242:581.162.32
Brève discussion sur la génétique des avoines. (**Brief discussion on the genetics of oats.**)

Bol. Soc. Broteriana 1937 : 12 : 2nd Sér. : 287-95.

The paper by Alabouvette and Friedberg (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 638) in which the origin of some fatuoid oats is discussed, is critically examined and it is suggested that natural hybridization is a more probable explanation than that of mutation as suggested by the authors.

225. EMME, H. 633.13:576.16
633.13:575.1

(**Evolution of oats of the section Euavena Griseb.**)

Biologičeskii Žurnal (Biologicheskij Zhurnal) 1938 : 7 : 91-122.

Tables are given showing all the *Avena* species at present known, their chromosome number and main characteristics, and the literature on their genetics, cytology, systematics and phylogeny is reviewed and discussed. On the basis of this, combined with her own results, the author reaches certain conclusions: e.g. that the collective species *A. strigosa* has evolved from some form of the type *hirtula*, from which the present Spanish and Mediterranean forms of *hirtula* have also been derived; it is possible that *A. Wiestii* is a race of *hirtula*; *strigosa* arose probably from the cultivated type as a recessive mutation, which probably occurred in several loci separately, giving rise to the various intermediate degrees now known. The *brevis* forms may have originated direct from *hirtula* or via *strigosa*; *nuda* has arisen as a recessive mutation from *strigosa* or *brevis*. *Vaviloviana* is related to *Wiestii* and also to *barbata* as well as *abyssinica*; *barbata* is thought to be an autotetraploid *hirtula* and to have arisen in several places independently: the two chromosome sets have since changed considerably and lost their homology.

Genetical and cytological, combined with other evidence, indicates that the 42-chromosome oats (*Denticulatae*) have arisen from the *Aristulatae* group during its migration eastwards; the group would appear to be polyphyletic and the wild and cultivated forms have probably evolved side by side.

From the point of view of practical breeding, the *byzantina* group is especially interesting, being characterized by large grain, high yield, resistance to smut, rust, frost, drought and saline soil.

226. OSIPOV, I. A. 633.13:581.48:575
(**Development of the new crop naked oats.**)
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1937 : No. 12 : 25-26.

The author, who, somewhat surprisingly, has failed to find reference to naked oats in the literature, describes such a form obtained by multiplying the progeny of a plant found by chance in a field. The new oat outyielded Victory, especially in drought years and in late sowings, and is even more drought resistant than such varieties as A-0315, probably on account of its early maturity, which is always 5-6 days sooner than that of other varieties. It was free from shedding and from the main diseases, lodging and damage by spring frosts.

227. COFFMAN, F. A.,
MURPHY, H. C.,
STANTON, T. R.,
BURNETT, L. C., and
HUMPHREY, H. B. 633.13-2.45-1.521.6:575(73)
New smut and rust resistant oats from Markton crosses.
J. Amer. Soc. Agron. 1938 : 30 : 797-815.

A report of progress in the task of breeding oat varieties for the north-central United States, resistant to stem rust and smut. The smut-resistant variety, Markton, was crossed with the rust-resistant varieties, Richland, Logold, Edkin, Iowa 444 and Rainbow. Selections were made from bulk progenies and also by the pedigree method, and were subjected to repeated inoculation with the spores of loose and covered smut, stem rust and crown rust. Many of the selections were found to be resistant to stem rust, covered smut and loose smut during several seasons, and some of the selections of Markton x Rainbow were also resistant to certain races of crown rust.

Selections from the crosses Markton x Rainbow and Markton x Logold have proved the most promising.

Some of the highest yielding selections from the cross Markton x Rainbow have a yield in excess of the standard varieties grown in the Corn Belt, are resistant to the smuts and rusts, and in addition have stiff straw and high bushel weight.

228. STANTON, T. R. 633.13-2.45-1.521.6:575(75.8)
Progress in oat breeding for the south.
Proc. 39th Annu. Convent. Ass. S. Agric. Wkrs, Atlanta, Ga 1938 : 56-57.
(Abst.).

Crown rust is recognized as the chief limiting factor in oat production in the southern United States. For many years no progress was made in reducing losses from this disease, owing to the absence of varieties with satisfactory resistance. The introduction of the Victoria oat from South America in 1927, and the subsequent introduction of further crown rust resistant varieties, made possible the breeding of better oats for the south.

Two of the introduced varieties, Alber and Berger have themselves proved satisfactory for growing in the south, but reliance has chiefly been placed on hybrids between the best commercial strains and the resistant varieties Victoria and Bond. Numerous selections resistant to crown rust, smut and cold and also of superior yielding ability and quality, are now being tested. Victoria has proved valuable for the introduction of smut resistance as well as crown rust resistance.

229. WILDS, G. J. (Jr.) 633.13-2.45-1.521.6:575(75.8)
633.13-2.111-1.521.6:575
Breeding oats for cold and disease resistance.
Proc. 39th Annu. Convent. Ass. S. Agric. Wkrs, Atlanta, Ga 1938 : p. 56.
(Abst.).

A brief survey of the oat-breeding activities of Coker's Pedigreed Seed Company, Hartsville, South Carolina since 1908. The present objective is to breed highly productive oat varieties combining resistance to cold, smut and crown rust.

230. MAXIMČUK. 633.13-2.7-1.521.6
633.11:575(47)
Bringing new varieties into cultivation).
Seleksija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 2 : 21-22.

Reference is being made to a new oat variety No. 0339 bred by the Verkhnjac station and characterized by high yield, resistance to frit fly and Hessian fly and to fungal attack; the wheat 09 produced by the same station and distinguished by productivity exceeding that of Ukrainka, winter-hardiness, disease resistance, high grain quality; the wheat Od.03 from Odessa, possessed of early maturity, resistance to smut, high quality and good yield; and

the two-rowed barleys Od. 08 and Od. 09, selections from local populations possessed of unusually high yielding ability: all these are considered to be superior to the varieties at present being grown and to merit wider adoption.

RYE 633.14

231. OSSENT, H. P. 633.14:575(43)
 10 Jahre Roggenzüchtung in Müncheberg. (**Ten years of rye-breeding in Müncheberg**).

Züchter 1938 : 10 : 255-61.

Different varieties of rye react differently to prolonged inbreeding; some show only a very slight degree of degeneration. It has also been observed that in individual progenies the expression of the degeneration may vary. Vegetative vigour may be affected in some cases, in others the fertility.

By 1937, after continuous inbreeding and selection a whole series of strains resistant to the ill-effects of inbreeding had been produced and a large number of crosses between them were made representing the beginning of a systematic combination breeding programme. One of the objects is the production of a rye with good baking quality and another the production of a perennial cultivated rye. Crosses between *S. cereale* and *S. montanum anatolicum* have been made and the promising progenies are being studied.

232. RUDNITSKII, N. V. 633.14:575(47)
 633.14 Vjatka
 (**A new variety of rye**).
 Seleksija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 2 : 18-20.

A brief outline is given of the product of the rye variety, Vjatka, by individual plant selection from a local population in the neighbourhood of the town of Kirov. The characteristics of the variety are described. Its advantages include winter-hardiness, disease resistance, freedom from shedding and lodging and high productivity, yield of 46 per cent in excess of the local population having been obtained.

In 1928 further breeding work was started with Vjatka with the object of improving the quality, using inbreeding and spatial isolation. A population has been produced which is more uniform than Vjatka in ear and grain characters, with shorter straw and not inferior resistance. It is superior in yield, though somewhat more exacting as regards soil conditions. The grain is much closer to the wheat Durable than Vjatka as regards protein content.

233. KOVARSKII, A. E. 633.14:575.3:581.02
 (**Variation of the genotype of winter rye under the influence of different growing conditions**).
 Seleksija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 4 : 26-27.

Seven rye plants of different genotypes were taken and each was divided vegetatively into three portions, which were grown under three different sets of soil conditions. The plants were bagged separately before pollination and at the same time ears from parts of the same plant growing under the different sets of conditions were combined under the same bag. It is claimed that an increase of fertility representing a change in genetic constitution, resulted from growing the plant portions under different conditions; thus 36 ears of the plants bagged alone produced only one grain, whereas 36 ears bagged according to the second method produced 84 grains.

234. SHMARGON, E. N. 633.14:576.312.34
 (**New data on the morphology of rye chromosomes**).
 C.R. (Doklady) Acad. Sci. U.R.S.S. 1938 : 20 : 43-45.

Root tips of rye were fixed in Lewitsky's strong platinic formalin solution after cooling for 24 hours at 0° C. The chromosomes were found to be of the following types (a) one large pair with sub-median centromere, the short arm satellited and the long arm with a secondary

constriction (*b*) two pairs of sub-median chromosomes with satellites, differing in size (*c*) two pairs of unsatellited chromosomes with median centromeres, again differing in size (*d*) one pair with a practically median centromere and a large satellite or "appendage" on the short arm and (*e*) one pair of satellited chromosomes with median centromeres. Thus all seven pairs of chromosomes are distinguishable from each other. Five of them have satellites.

235. SMERNITSKAJA, M. I. 633.14:581.143.26:575.127.2

(**Breeding rye at the Kharkov Station**).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 5 : 38-41.

Crosses have been made between cultivated rye and perennial rye, *Secale montanum*, various strains of each being used. The most successful combinations are indicated. The germination of the hybrid seeds was poor and the F₁ plants were highly sterile and very late in maturity; some few were perennial but the rest annual in habit. The other characters of the perennial parent were mostly dominant, though the grain was of the cultivated type. Pollination of the hybrids with cultivated rye gave only 4·4 per cent success. A great rise in fertility was observed in the back-cross hybrids, amounting to 70 per cent. in the second generation and a number of perennial plants occurred in both these generations.

236. MIKHAILOVA, E. 633.14:664.641.016:575.42

(**Vitreous rye**).

Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1938 : Nos 7-8 : 161-65.

Marked differences were detected within the variety Novozybkovskaja M-4 of winter rye in respect of starch, sugar and protein content. The protein content was not correlated with vitreousness, which proved to be little influenced by manuring, and only slightly by soil moisture. Three plants having yellow vitreous grain were selected and selection for the same type was carried out in their progeny. The resulting vitreous families proved more productive and hardier than the original strain and the protein content of the grain and the baking quality of the flour was better in most of them.

MAIZE 633.15

237. GORST, G. F. 633.15:575(47)

(**Maize breeding and seed raising in Kabardino-Balkaria**).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 4 : 43-45.

An account of the selection work that is being carried out with botanical varieties and sub-varieties chosen from the local populations of maize in Kabardino Balkaria. The names and characteristics of some of the improved types are given with their origins.

238. HULL, F. H. 633.15:575(75.8)

633.15-2.7-1.521.6

Corn improvement in the south.

Proc. 39th Annu. Convent. Ass. S. Agric. Wkrs, Atlanta, Ga 1938 : 54-55.
(Abst.).

The average yield of 600 double crosses of inbred lines developed at Gainesville, Florida, was more than 20 per cent above Whatley Prolific, the best open-pollinated variety in the region, and 40 per cent above the best widely grown open-pollinated variety. This suggests that the development and growing of hybrid maize varieties for the South would be profitable, though the increases in yield in bushels per acre would not be as high as in the Corn Belt.

Whatley Prolific cannot be widely grown, as it is not sufficiently resistant to weevils. Two new strains have been developed from it at Gainesville by mass selection in the open-pollinated progeny of a population consisting of 75 per cent Whatley and 25 per cent of six weevil-resistant strains. The latter were selected on the basis of their crosses with Whatley. The new strains equal Whatley in yield and have superior weevil resistance.

239. DOBZHANSKY, Th. and RHOADES, M. M. 633.15:575.11:576.356.2
A possible method for locating favorable genes in maize.
J. Amer. Soc. Agron. 1938 : 30 : 668-75.

In the method suggested based on that used in the genetic analysis of natural populations of *Drosophila pseudo-obscura*, inversions are used to suppress crossing-over and known genes to mark specific chromosomes. Plants which are known to carry in duplicate a given chromosome of the line or plant to be tested can then be produced.

240. BRIEGER, F. G. 633.15:575.12
Problemas de melhoramento do milho. (Problems of maize improvement).
Rev. Agric. S. Paulo 1938 : 13 : 213-28.

The single and double cross methods used in maize breeding are described, with indications of points for which it is desirable to select, such as earliness, types of cob, etc.; possible linkages must not be overlooked and reference is made to the desirability of utilizing the strains used by the Indians.

241. ROBINSON, J. L. 633.15:575.12
The story of hybrid corn.
Ext. Circ. Ia Coll. 1937 : No. 234 : Pp. 16.

The method used in the production of double-crossed hybrid maize is described, with a view to enabling farmers to raise their own hybrid seed from pure lines or first crosses obtained from the Experiment Stations. This is desirable at present, since the supply of commercially-produced double-crossed seed does not nearly meet the demand.

242. BRIEGER, F. G. and GRANER, E. A. 633.15:575.14
Variações quantitativas no milho "Santa Rosa". (Quantitative variations in "Santa Rosa" maize).
Rev. Agric. S. Paulo 1938 : 13 : 263-84.

Measurements were made on 285 plants belonging to 18 selfed lines of Santa Rosa maize and the results examined statistically, the characters studied being height of plant, height of cob and number of internodes. The first two showed a reduction in the first inbred generation but the coefficient of variation of the characters was not much different from that of the initial population, which was known to be very heterozygous. The individual lines differed somewhat in their coefficients of variation, some being distinctly less than the original population.

A positive correlation was observed between height of plant and height of cob. As it is desired to produce a type in which both these characters are less than in Santa Rosa it is proposed to cross this variety with short plants of imported varieties.

243. GRANER, E. A. 633.15:575.14
Variações qualitativas no milho "Santa Rosa". (Qualitative variations in "Santa Rosa" maize).
Rev. Agric. S. Paulo 1938 : 13 : 229-36.

An examination of the first selfed generation of the Brazilian variety Santa Rosa revealed great variations in size of plant and of the individual organs, a general reduction in size being observed. Other anomalies observed included ears in which one quarter of the seeds were defective, others bearing seeds deficient in germination capacity and segregating monofactorially for albinism; plants with crinkly leaves; ramification of stem and of inflorescence and various silk deficiencies. In all about 40 per cent of the plants were defective in one way or another, this high proportion being accounted for by the fact that Santa Rosa is a very mixed and hybrid population. By intercrossing some of the segregates it might be possible to recover the original type.

244.

OVERBEEK, J. van

633.15:575.242:581.44:581.1

577.17:575.242

"Laziness" in maize due to abnormal distribution of growth hormone.

J. Hered. 1938 : 29 : 339-41.

The "lazy" mutation in maize is found to be accompanied by an abnormal distribution of auxin in the stem. When placed horizontally for some time, normal maize plants have a higher concentration of auxin in the lower than in the upper half of the stem. In the "lazy" plants examined, this distribution was reversed in most cases.

"Lazy" plants may be slightly positively geotropic, a-geotropic, or slightly negatively geotropic. The data suggest that there are corresponding variations in the distribution of auxin in the upper and lower split halves of the stem.

245.

HARTLEY, C. P.

633.15:575.42

Mejoramiento por selección de la semilla de maíz. (**Improvement of maize by seed selection**).

Rev. Agric., Guatemala 1938 : 15 : 239-42.

The importance of seed selection is stressed and the most desirable features indicated for would-be selectors.

246.

MANGELSDORF, P. C. and

633.15:576.1:575.242

REEVES, R. G.

633.15 *Euchlaena*:575.127.5**The origin of maize.**

Proc. Nat. Acad. Sci. Wash. 1938 : 24 : 303-12.

A study of *Zea-Tripsacum* hybrids indicated that crossing-over can occur between the chromosomes of these two genera, leading to the incorporation of *Tripsacum* characters in maize and vice versa. If this had occurred in the wild the altered maize derivative would be capable of surviving if the characters received had been the prominent horny glumes and the brittle rachis of *Tripsacum*, for these would respectively protect and help the dispersal of the seeds. Such a plant, however, would resemble *Euchlaena* and the hypothesis is considered that *Euchlaena* is in fact a derivative of a *Zea-Tripsacum* cross.

In studies of *Zea-Euchlaena* hybrids back-crossed to *Zea* it was found that the essential differences between the two genera give a four-factor Mendelian segregation and it is inferred that these factors are in fact intercalated segments of chromosome behaving as units in inheritance. This is compatible with their having been derived from *Tripsacum*. Two of the segments are located at opposite ends of chromosome 4.

The archaeological evidence supports the hypothesis, for it suggests that *Euchlaena* originated after the Mayas abandoned the Old Empire and migrated to the highlands (about 600 A.D.), bringing *Zea* and *Tripsacum* in direct contact on a large scale.

If *Euchlaena* is in fact a recent development, the authors see no objection to pod corn as the putative ancestor of cultivated maize—the latter being thus derived by a single recessive mutation, of no survival value in the wild but very valuable in domestication.

Neither do they see any necessity for seeking the centre of origin of maize in Mexico or Central America. Most of the evidence has pointed to Peru, except the close relationship with teosinte. A difficulty encountered here is that pod corn is unknown in Peru. However, prehistoric Peruvian pottery was found to give representation of pod corn. It is suggested that though Peru was the centre of domestication, the wild habitat of maize was the lowland, rainy-green savannah of South America.

It may also be argued that since *Euchlaena* is derived from a *Zea-Tripsacum* cross and since maize crosses easily with teosinte, the maize varieties of North America ought to include new types not occurring in South America, and that *Tripsacum* characters ought to be traceable in the North American varieties. Pop corn is instanced as an example of the new types and chromosome knobs as an instance of *Tripsacum* characters. A South American variety, Cuzco, was found to have no knobs.

247. GROSSMAN, A. M. 633.15:576.312.35
On the elimination of supernumerary chromosomes in Zea mays.
 C.R. (Doklady) Acad. Sci. U.R.S.S. 1937 : 15 : 355-58.

The data on the occurrence of supernumerary chromosomes in maize are briefly reviewed. The author's own observations on the Black Mexican variety of maize show that there is an elimination of some of these chromosomes between early prophase and metaphase. This would account for the varying numbers reported by different workers and supports the assumption that the supernumerary chromosomes differ fundamentally from the basic chromosomes.

248. McCLINTOCK, B. 633.15:576.356.2
The fusion of broken ends of sister half-chromatids following chromatid breakage at meiotic anaphases.

Res. Bull. Mo. Agric. Exp. Sta. 1938 : No. 290 : Pp. 48.

A detailed study of the cytological consequences of crossing-over in a large inverted region in chromosome 4 in maize. Such crossing-over gives chromatin bridges at meiotic anaphase, accompanied by acentric fragments. These bridges are later broken at some point along their length, so that some of the spore nuclei will contain a broken chromosome 4. In this material, chromatin bridges were also frequently observed in the first mitosis in the pollen grain. Evidence is presented which indicates that these result from the union of the broken ends of sister half-chromatids of the dicentric chromosome 4. It appears that this union always occurs, but it is not known precisely at what stage. Two possibilities are suggested. The chromatids may already be split at meiotic anaphase, so that fusion may occur immediately after the break. Alternatively, if the chromatids are not split, the division of the broken end at a later stage may be in some way inhibited, so that it appears as a bridge between the two daughter chromatids at the next division.

The behaviour of the acentric fragment is also studied. It often becomes attached to the end of a normal chromatid of the bivalent at first anaphase. In subsequent divisions it may fortuitously be included in one of the nuclei. If this happens, it performs its normal genetic function, and sometimes makes possible the transmission of a large deletion in chromosome 4 through the pollen.

249. RANDOLPH, L. F. and HAND, D. B. 633.15:577.16:576.356.5
Increase in vitamin A activity of corn caused by doubling the number of chromosomes.

Science 1938 : 87 : (N.S.) : 442-43.

A tetraploid strain of maize was found to contain 43 per cent more carotinoid per gram of dry meal than the corresponding diploid strain. The endosperm cells of the tetraploid had 3.5 times the volume of those of the diploid.

250. OVERBEEK, J. van 633.15:577.17:575.11-181.13
Auxin production in seedlings of dwarf maize.
 Plant. Physiol. 1938 : 13 : 587-97.

While the seeds producing *nana* dwarfs were found to contain the same amount of auxin as seeds producing normal plants, *nana* dwarfs 4 to 5 days after sowing produce less auxin than their normal sibs. At 6 to 7 days they produce the same amount. The amount of auxin reaching the growing regions of the 6- and 7-day-old *nana* plants is, however, much less than in the normal sibs, owing to greater destruction of auxin in the former. The production of auxin in *dwarf-1*, *dwarf-2*, *dwarf-3*, *dwarf-7* and the *pigmy* dwarf was found to be lower than in their normal sibs.

251. SOSA-BOURDOUIL, C. and
MIÈGE, E. 633.15:581.192:581.48:575.127.5
Étude des hybrides entre Zea et Euchlaena. I. Hérédité du taux de l'azote chez Zea mays x Euchlaena mexicana. (Study of hybrids between Zea and Euchlaena. I. Inheritance of nitrogen content in Zea mays x Euchlaena mexicana).
 Bull. Biol. 1936 : 70 : 358-69.

In the F_2 of a cross between a variety of maize with shrunken endosperm and *Euchlaena mexicana*, roughly $\frac{1}{20}$ of the grains were shrunken.

There were no clear differences between the carbon and hydrogen contents of the grain of the two parents, but the nitrogen content was much higher in *Euchlaena mexicana* than in maize. The F_1 was intermediate, and so also was the F_2 , but the grains of the latter generation showed more variability in nitrogen content, and some of them approached the parental values. There was no obvious correlation between nitrogen content and the various morphological types of grain which could be distinguished in F_2 . There was a general tendency for the low nitrogen content of the maize parent to behave as a recessive character.

252. PATCH, L. H. and
BOTTGER, G. T. 633.15-2.7-1.521.6:575
Investigations of the varietal resistance of field corn to the European corn borer in 1936.
 U.S. Dep. Agric., Bur. Ent. Pl. Quarantine 1937 : September : Pp. 11.
 (Mimeographed).

Various inbred lines and strains of hybrid maize were artificially infested with corn borer eggs at various stages in their development, and the percentage of borer survival determined as a measure of resistance.

The more immature a variety was at the time of infestation, the lower the rate of borer survival. Late plantings therefore escaped attack to some extent. The rate of growth of the borers which did survive on immature plants was found to be retarded.

The resistant hybrid Hy x R4 showed an average borer survival 0.47 times of that of the susceptible hybrid A x Tr. The growth of the borers which survived on the resistant strain was retarded as compared with their growth on the susceptible strain. The resistance of Hy x R4 was not due to (a) lower initial infestation, (b) differences in maturity, or (c) smaller leaf area, but appeared to be due to other causes.

Of 136 inbreds tested in 1935, fifteen which had a low rate of borer survival were tested in 1936, and compared with inbred lines which had a higher borer survival in 1935. The variation between lines was less in 1936 than in the previous year. Six of the inbreds tested seemed to possess resistance to the borer, the survival being significantly lower than expected on the basis of their maturity. These were Mich. 77, Mich. 2774, Ill. R4, Mich. 106, L317B2 and 1205.

The inbreds R4, Hy and L317 generally transmit considerable resistance to borer attack when they are used in crosses. Exceptions to this occur, however. When one or more of the borer-susceptible lines A, Tr or WF9 also contribute to the cross, no advantage seems to be gained from the resistant parent.

The Michigan strain 561, claimed to be borer resistant, was found to have no true resistance when judged either by the amount of borer survival or by the extent of the reduction in yield due to borer attack.

253. BREDEMANN, G. and
RADELOFF, H. 633.15-2.7-1.521.6:575
Untersuchungen über die Ursachen der Widerstandsfähigkeit des "Maiz amargo" gegen Heuschreckenfrass. (Investigation on the causes of the resistance of "Maiz amargo" to locust attack).
 Rev. Sudamer. Bot. 1938 : 5 : 129-44.

"Maiz amargo" or bitter maize is only attacked by locusts when nothing else is available and even then little damage is done. If the bitter maize is to be used for breeding resistant varieties it is necessary to discover the causes of resistance.

The investigation showed that the dense pubescence of the variety was the cause of the resistance. The authors mention that the Evergreen Sweet Maize variety is as pubescent as the bitter maize.

BARLEY 633.16

254. BAKHTEEV, F. Kh. 633.16:575:581.46
(On the naked barleys of A. F. Judin).
 Seleksija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 1 : 28-29.

The writer discusses the identity of the barleys Ju-1 and Ju-5, which Judin claimed to have produced from the botanical variety Pallidum, their origin, their morphological features and their performance alone and in trials with other barleys including Pallidum -043.

255. GREBENNIKOV, P. E. 633.16:575.11"793"
(Notes on the question of the origin of winter barley). 633.16:576.16
 Proc. Agric. Inst. Krasnodar 1935 : Issue 1 : 65-79.

The views of a number of authors regarding the origin of cultivated barley are discussed; the problem is regarded as still unsolved.

Among the local barleys of the Don regions a few plants behaving as winter forms were found in certain strains in the proportion of about one in a thousand. Occasional winter forms appeared also in the F_2 of some crosses between different spring barleys; in 40 combinations involving 46 different pure lines representing 15 different botanical varieties, winter plants segregated in four combinations. Descriptions are given of these segregates and of the parental forms. Subsequently more extensive crosses were made between the forms in question. The F_1 's were all spring forms, intermediate in type, the F_2 segregated for a number of characters, including time to reach maturity, which varied from 60 to 105 days in the plants that eared, leaving a few plants, in the proportion of about 1 : 15, that failed to ear; dihybrid segregation into spring and winter types was confirmed in the F_3 . In other crosses the winter forms appeared only in a trihybrid ratio and in one combination tetrahybrid and the conclusion is reached that at least 5-6 genes are responsible for the winter habit, and that these are independent of the genes for winter-hardiness.

256. TAVČAR, A. 633.16:575.127.2:581.46:575.11
 Vererbungsart der Spindelstufenzahl bei Bastardierungen einiger *distichum* x *vulgare* Wintergersten. (**The inheritance of the number of rachis segments in crosses between some *distichum* and *vulgare* winter barleys.**)

Z. indukt. Abstamm.- u. VererbLehre 1938 : 75 : 106-23.

Crosses were made between pure lines of 2-rowed *Hordeum distichum* and 4-rowed *H. vulgare*. Statistical investigations on the variation of the pure lines showed that there was only relatively slight variation of number of rachis segments during the years when the experiments were made. The *distichum* strains had a higher number of rachis segments than the *vulgare* strains.

In the F_1 the number of rows as well as number of rachis segments were intermediate. In F_2 there was a transgressive segregation for number of rachis segments. When considered in connexion with the number of rows, the F_2 *vulgare* variants had on an average a smaller number of rachis segments than the *distichum* variants.

The segregation of the character for number of rachis segments can be explained on a mono-factorial basis.

Linkage was observed between the gene *Z* for number of rows and the gene *S* for number of rachis segments with a crossing-over percentage of 32.94.

These results show the possibility of producing homozygous *vulgare* forms with a number of rachis segments as high as in the *distichum* forms.

257.

DIDUS', V. I.

633.16:575.242

(Natural mutations in "pure lines" as a source of new varieties of self-fertilized plants).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 5 : 30-34.

Natural mutants of 22 different types have been observed in two varieties of barley during three years of study and the most interesting are described. The first is a tri-barbate type in which the inner palea bears two awns, in addition to the one occurring on the flowering glume; the inner palea also has six nerves instead of the usual two.

Another mutant developed a spikelet from the basal bristle of the grain; the character was recessive in inheritance. Other mutants were a short-awned form in which the awns fall off at maturity; an early form maturing 10-11 days before the control; a late form 3-4 days after the control; a lax eared form with longer leaves and straw and another lax form with larger grains (42.7 grm.), rapid, vigorous growth and resistance to *Helminthosporium*; a dense eared form with short, strong straw, exceeding the original in yield and resistance to *Helminthosporium* and drought: this mutant is of especial interest to breeders; a very dense type with short straw, some forms being dominant and some recessive in inheritance; a form with large, short grains, large leaves, strong straw and 20 per cent higher yield, together with *Helminthosporium* resistance; a mutant with narrow, slightly pendulous ears, and small grains; and lastly a type free from anthocyanin in the leaves.

In addition to the above, certain plants externally resembling the type but with 20-25 per cent lower yield were also detected.

258.

DIDUS', V. I.

633.16:575.242:581.46

(Study of the spontaneous variation of pure lines of *Hordeum* I. A new variety of cultivated two-row barley *H. distichum* var. *triaristatum* mihi).

J. Bot. U.R.S.S. 1936 : 21 : 189-95.

A mutant form is described in which the inner palea bears two awns, which together with the normal awn on the outer palea gives the floret a tri-barbate form. The second generation from the mutant plant reproduced the anomaly. The tri-barbate form differs from the original also in the grain, which is less closely enveloped by the husk and somewhat longer, and in certain other minor characters. It is regarded as a distinct variety, *triaristatum*, and is described in Latin.

Various other mutants have also been found (Cf. Abst. 257).

259.

HARLAN, H. V. and

MARTINI, M. L.

633.16:575.41

The effect of natural selection in a mixture of barley varieties.

J. Agric. Res. 1938 : 57 : 189-99.

A mixture of 11 varieties of barley was grown at 10 stations for periods ranging from 4 to 12 years, seed being saved at each station for the following year. Population counts were made annually. At each station the less adapted varieties were quickly eliminated and the variety, varying with the locality, which would eventually dominate the population quickly became evident. Some varieties increased for a time and then decreased.

The trends of the best, intermediate and poorest varieties are shown to agree in general with those expected theoretically on a simple calculation.

260.

JUDIN, A. F.

633.16:575.42:581.48

633.16:581.46

(Transmutation of the nature of barley).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 3 : 28-31; also Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1938 : No. 2 : 212-18.

A careful examination of the grains from five ears of the variety Pallidum 043 showed slight variations in the firmness with which the grain was enclosed by the husk and by selecting

the variants in the direction of less firm enclosure it was possible after six generations to produce a completely naked form. Selection was carried out simultaneously for luxuriance of root system, which was found to be associated with vigorous tillering, for maximum size and number of leaves, uniform ripening of ears, frost resistance, and size and white colour of the grain, the plants with white grains having been found to be less susceptible to fungous diseases. In this way a form free from the usual defects of naked barleys was obtained. Aerial branching at the first, second and even third node was present in some of the plants, which consequently produced a second crop of grain after the first ears had been reaped. Other anomalies observed were branching ears and spikelets with two or three florets, giving an equal number of grains.

261. ÅBERG, E. 633.16:576.16:582
***Hordeum agriocriton*, a wild six-rowed barley.**

Chronica Botanica 1938 : 4 : p. 390.

A new species of barley, *H. agriocriton*, collected at 3000m. in Taofu, is described. It is a six-rowed form with a brittle rachis, and appears to be closely related to the two-rowed *H. spontaneum*.

262. ELIZAROVA, S. S. 633.16:577.15:575.1
(Inheritance of enzyme characters. Catalase of barley).

Bull. Acad. Sci. U.R.S.S., Sér. Biol. 1937 : 1781-87.

The catalase content in eight-day-old etiolated seedlings was determined in a number of barley varieties, significant differences being detected between varieties, northern varieties being richer than southern varieties; marked annual and seasonal fluctuations were observed. F₁ hybrids between different types indicated that low catalase content is dominant.

263. BONNETT, O. T. 633.16:581.46:575.11
Hood and supernumerary spike development in barley.

J. Agric. Res. 1938 : 57 : 371-77.

The morphological development of the hoods in hooded barley is described and illustrated. The author believes that it is too complicated to be controlled by a single gene.

The occurrence of supernumerary spikes in both awned and hooded barley was noted and ascribed to a combination of low temperature and short days.

264. SOSNIN, A. 633.16:581.48:575
(New spring varieties of naked barley).
 Seleksija i Semenovodstvo (Breeding and Seed Growing) 1937 : No. 12 : 23-25.

Descriptions are given of a number of naked barley varieties that have surpassed the standard husked varieties by up to 8 per cent in yield, with indications on their origin.

265. HONECKER, L. 633.16-2.42-1.521.6:575.11
 Über die physiologische Spezialisierung des Gerstenmeltaues als Grundlage für die Immunitätszüchtung. (On the physiological specialization of barley mildew as a basis for breeding for immunity).
 Züchter 1938 : 10 : 169-81.

The author deals with the behaviour of the fungus in the field and the damage it causes to barley. The methods of infection are described and the types of infection are classified into seven groups, from immune to very susceptible. The problem of physiological specialization is discussed and the question of the behaviour of barley varieties and their value for breeding is considered.

Only a few varieties of barley are suitable as parents in breeding for resistance as the resistant variety is often also susceptible to rust; and as many other qualities have to be combined before a satisfactory strain is produced, progress must be slow. The inheritance of the various

immunity and resistance factors is mono-, di- or polyfactorial according to the variety and to the races of mildew present, so the capacity for resistance may be dominant, recessive or intermediate.

The inheritance of immunity is usually monofactorial and of resistance, polyfactorial. Immunity or resistance of certain barley varieties to several races of mildew is conditioned by one and the same factor.

An extensive study of the genetics of mildew resistance will be published shortly elsewhere.

266. LUNDIN, H. 633.16:663.421:575(48.5)

Barley breeding and malting.

Brew. Tech. Rev. Chicago 1936 : 11 : 219-22. (Abst.).

A brief review of the work on breeding barley for the brewing industry already accomplished at Svalöf and an account of malt processing in Sweden.

MILLETS AND SORGHUMS 633.17

267. WHELDEN, R. M. and 633.174:581.143.7:537.531
HASKINS, C. P.
Note of an unusually transmitted lethal effect in X-rayed sorghum.

Bot. Gaz. 1938 : 99 : 872-76.

In an experiment in which sorghum grains heterozygous for a white chlorophyll deficiency were irradiated with X-rays for different periods and the grains so treated germinated on agar it was found that, with irradiation for 64 minutes, the seedlings one generation removed from the treatment were uniformly stunted in a characteristic manner, whether they were white or green. This is apparently a case of an X-ray effect skipping a generation and further work is in progress on the phenomenon.

268. SWANSON, A. F. 633.174-2.183-1.521.6:575
"Weak neck" in sorghum.

J. Amer. Soc. Agron. 1938 : 30 : 720-24.

Dwarf varieties of grain sorghum for combine harvesting need strong stalks and peduncles. The term "weak neck" has been coined to describe a condition, particularly prevalent in milo types, in which the tissues of the peduncle, especially at the base, become disintegrated and weakened, leading to a large proportion of heads broken where the peduncle joins the uppermost node of the stalk. The cause of this condition is unknown. Sorgo and kafir types are resistant and almost completely resistant progenies were found in the F_3 of Leoti Red Sorgo x Club, which produced a number of promising dwarf types.

"Weak neck" is not at present a serious problem to the farmer, but the plant breeders must take the necessary precautions to prevent its becoming one in the future.

RICE 633.18

269. MONTAGNAC. 633.18:575(69.1)
Recherches sur le riz effectuées à la Station Agricole de Marovoay (1936).
[Researches on rice made at the Agricultural Station of Marovoay (1936)].

Riz. et Rizic. 1937 : 11 : 185-216.

The aim of the station has been to produce new varieties adapted to the various districts which will give a high yield of hard and translucent grain.

Mass selection and pedigree selection are practised to improve the varieties and a number of new varieties have been introduced from Spain, Italy and other districts.

A number of crosses have been made to produce the desired type.

Some experiments were made with a mechanical sorter to test the possible improvement by this method but the results showed that with a pure variety there is no advantage to be gained. The rest of the report is concerned with cultural methods for the improvement of quality.

270. MORINAGA, T. 633.18:575.116.1.061.6:581.44
Inheritance in rice, *Oryza sativa* L. II. Linkage between the gene for purple plant colour and the gene for liguleless.
 Jap. J. Bot. 1938 : 9 : 121-29.
 The gene P_1 for full purple leaf colour is found to be linked to the gene l_g for liguleless with 21-22 per cent of crossing-over. Panicle density (normal v. lax) segregates independently of these factors.
 A summary is given of all known cases of linkage in rice.
271. CAPINPIN, J. M. and 633.18:575.125:575.11
 PUNYASINGH, K.
A study of varietal crosses and hybrid vigor in rice.
 Philipp. Agric. 1938 : 27 : 255-77.
 In the F_1 hybrid between various Siamese rice varieties, hybrid vigour was observed. The following characters were dominant: presence of anthocyanin (v. absence), green inner glume (v. brown-furrowed inner glume), partly awned (v. awnless), and non-shattering (v. shattering).
272. CHIAPPELLI, R. 633.18:575.42(45)
La selezione del riso. (Rice selection).
 G. Risicolt. 1938 : 28 : 124-32, 141-49, 167-72.
 A general account of the methods of rice cultivation and of selection as practised in Italy.
273. GUSTCHIN, G.-G. 633.18:576.16
Le riz. Origine et histoire de sa culture. (Rice. Origin and history of its cultivation).
 Riz et Rizic. 1938 : 12 : 61-96.
 The area bounded by the southern slopes of the Himalayas and certain mountain ranges of China is suggested as the centre of origin of rice.
 The various methods of rice cultivation are described, and the genealogy of cultivated rice, *Oryza sativa*, is discussed.
274. BEACHELL, H. M., 633.18:581.162.32
 ADAIR, C. R.,
 JODON, N. E.,
 DAVIS, L. L. and
 JONES, J. W.
Extent of natural crossing in rice.
 J. Amer. Soc. Agron. 1938 : 30 : 743-53.
 Glutinous and common varieties of rice were grown in alternate rows spaced 1, 2 and 3 feet apart, at stations in Texas, Arkansas, Louisiana and California and in successive years. The percentage of common grains occurring on the glutinous varieties was taken as a measure of cross-pollination. The general average was 0.45 per cent, over two million grains being classified. The percentage varied with the pair of varieties, station and season concerned and in the case of one pair of varieties there was appreciably more cross-pollination at the one foot spacing than at two or three feet.
 It was also observed that from 0.02 to 0.30 per cent cross-pollination occurred even when the glutinous varieties were 30 feet away from the nearest common variety.
275. MORITA, K. 633.18:581.162.5:575:576.356.5
(Studies in the sterile rice plants).
 Proc. Crop Sci. Soc. Japan 1936 : 8 : 373-84.
 A study of the pedigrees of 43 plants exhibiting sterility with 44-49 per cent of blasted panicles, showed 3 were completely sterile, 16 segregated into sterile and fertile progeny and 24 gave

completely fertile progeny. In the segregating pedigrees two $2n + 1$ type sterile plants were found, and of the 3 entirely sterile plants one was of the $2n + 4$ type.

The $2n + 1$ type sterile forms have highly sterile pollen and short panicles partly covered by leaf sheaths, set no fertile seeds, are weak in constitution and exhibit more parthenocarpy than the $2n$ sterile type.

The $2n + 4$ type of sterile plant resembles the preceding one but has still shorter and smaller ears which are more covered by the leaf sheaths and is even weaker than the $2n + 1$ type. The author conjectures that the $2n + 1$ type is a variant of the $2n$ sterile plants and not a derivative from a form with an irregular number of chromosomes. The $2n + 4$ type is thought to be derived from a triploid parent.

276. JONES, J. W. and ADAIR, C. R. 633.18:581.18:575.242
A "lazy" mutation in rice.
 J. Hered. 1938 : 29 : 315-18.

The "lazy" plants are ageotropic and the character behaves as a simple mendelian recessive, apparently originating as a mutation in an F_2 plant of the cross Caloro x Blue Rose in 1931.

277. KAGAWA, F. 633.18:581.48:575.11-181
 633.18:575.24:581.162.5
(A case of inheritance of semi-sterile rice plants with large grains and their chimaeras).
 Proc. Crop. Sci. Soc. Japan 1937 : 9 : 319-40.

Partial sterility of a large-grained form of highland rice is attributed to a double recessive $a\alpha$ which has arisen either (1) by somatic mutation of one of the normal A allelomorphs, followed either by self-pollination of the mutant or hybridization with another plant heterozygous for the same gene; or (2) by gene mutation in reproductive cells of normal plants. The occurrence of normal ears as "chimaeras" among such sterile large-grained plants is attributed to the mutation of a to A resulting in either a heterozygous or homozygous normal form.

HERBACEOUS AND LEGUMINOUS FORAGE PLANTS 633.2/3

278. WAHLEN, F. T. 633.2/3:575:631.531.12
 Züchtung und Saatgutgewinnung bei den Futterpflanzen. (**Breeding and seed production of fodder plants**).
 Die Grüne, Mitt. Arbeitsgemeinschaft zur Förderung des Futterbanes, No. 9
 1938 : Pp. 24.

A general account of the history, principles and methods of breeding grasses and clovers and their cultivation for seed production.

279. HERTZSCH, W. 633.2:575.127
 Art- und Gattungskreuzungen bei Gräsern. (**Species and genus crosses in grasses**).
 Züchter 1938 : 10 : 261-63.

A tabulated list of the crosses made is given together with the number of flowers pollinated, number of seeds set and percentage set.

The experiments were made on species of *Festuca*, *Bromus*, *Lolium*, *Dactylis* and *Agropyrum*. Of the genus crosses, *Bromus arvensis* ♀ x *Festuca gigantea* ♂ gave a 10.7 per cent set and that between *Melica ciliata* and *Elymus arenarius* a 6.7 per cent set. Further information on the development of the seeds so obtained will be published later.

280. WINKLER, H. 633.263:575.127.5:633.264
 Ein interessanter Fund von wildwachsendem *Lolium perenne* L. nebst einem aus demselben erhaltenen, spontanen Bastard mit *Festuca pratensis* Huds. (= "*Festuca loliaeae*" Curt.) in der Provinz Ångermanland in Nordschweden. [An interesting find of wild *L. perenne* L. together with a natural hybrid of it with *F. pratensis* Huds. (= "*Festuca loliaeae*" Curt.) in the province Ångermanland of North Sweden].
 Bot. Notiser 1938 : 440-57.
- ÅKERBERG, E.
The chromosome number in the hybrid and its parents.
 Bot. Notiser 1938 : 456-57.
- The hybrid of *F. pratensis* x *L. perenne*, though frequent in nature, is difficult to produce artificially; the literature on the subject is reviewed and discussed. A natural hybrid of these two species found in Undrom in North Sweden in 1932 is described. Hybrids, which were of three types, were of more luxuriant growth than either parental species, their ears displayed characters of both; pollen grains were formed but were nearly all empty and no seed has ever been set by open pollination or back-crossing with the parents. The second crop of tillers resembled *L. perenne* more than the first. The position of the hybrid in relation to surrounding plants makes it clear that *L. perenne* was the maternal parent, hybridization having been favoured by its almost complete pollen sterility. The discovery of this hybrid is thought finally to prove the hybrid nature of the form often referred to in the past as *F. loliaeae*. All three of the hybrids described by Winkler proved to be diploid, $2n = 14$, as in the parent species.
281. BULAŠEVIĆ, N. E. 633.264:575.127.5:633.263
 (Hybrids of *Festuca pratensis* Huds. and *Lolium perenne* L.).
 Seleksija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 7 : 27-29.
- Both species have the same chromosome number, $2n = 14$, but a high degree of sterility is observed on crossing them, varying from 30 to 100 per cent in different combinations of forms. A natural hybrid characterized by high fertility has been found by the author and an F_2 and F_3 have already been obtained. An examination of large numbers of seeds of the fescue variety Leningrad No. 314 in which the hybrids were discovered revealed a large number of deviating forms of apparently hybrid origin, plants of both rye grass and fescue type being represented; they were superior to the standard strain of fescue in early development and in yield. The hybrids were highly fertile and gave a certain amount of seed even when bagged. Certain mosaic individuals appeared, and also a number of aberrant types such as liguleless and dwarf plants. The hybrids of the rye grass type were superior to the pure species in winter-hardiness, remaining undamaged by temperatures of -6°C , which shows that one of the main objects of combining these two species has been attained.
282. SCHIEBLICH, J. 633.282:575
 Untersuchungen zur Züchtung von Sudanras und Hirsearten. (Investigations on the breeding of species of Sudan grass and millet).
 Landw. Jb. 1938 : 86 : 372-429.
- Sudan grass *Sorghum sudanensis*, which is to be distinguished from *S. halepense*, is suitable only for green fodder and among the main aims in breeding are earliness and adaptability. An account is given of the systematics, variety of forms and floral biology; the conditions of climate and soil required by the plant including its photoperiodic reaction as well as the time of sowing, quantity of seed required and the pests and diseases which attack the plant. In order to investigate the problem of whether it is possible to alter the content of hydrocyanic acid in Sudan grass, a method was devised for the estimation of small quantities of hydrocyanic acid in Sudan grass.

acid. Selection was made to reduce and eliminate the content of hydrocyanic acid. The plants were selfed and the first generation plants that were free from hydrocyanic acid were further selected. By the third generation the proportion of these plants was considerably increased. This character is probably recessive but as the original material was probably very heterozygous it is impossible to analyse the inheritance more closely and only when homozygous material is available for crossing will an accurate analysis be possible.

The hydrocyanic acid content of the Great Sorghum (*S. vulgare*) is much greater than that of Sudan grass and very few plants free from hydrocyanic acid were found.

Investigation on systematics, number of varieties, gene centres, climatic and soil requirements were also made on the Great Sorghum. There exist forms most suitable for use as green fodder and others for their seed production. Earliness is the main aim in breeding and the importance of heterosis in this plant is pointed out.

Similar investigations have been made on *Panicum miliaceum*, *Setaria italica* and *Pennisetum typhoideum*. In the first two, high yield and crude protein content are important aims in breeding and earliness in the last-named.

283. COLEMAN, O. H. and
ROBERTSON, D. W. 633.282:581.192.6:575.1
Preliminary report on inheritance of differential ability of inbred lines of sudan grass to produce HCN.

Tech. Bull. Colo. Agric. Exp. Sta. 1938 : No. 24 : Pp. 8.

Differences between various inbred lines of Sudan grass in degree of HCN production may be inherited. In the lines studied, some correlation was observed between high HCN content and non-glossy leaves, and between high HCN and purple tipped seedling leaves.

284. SIMONET, M. and
GUINOCHEZ, M. 633.289:576.16:581.9
Observations sur quelques espèces et hybrides d'*Agropyrum*. II. Sur la répartition géographique des races caryologiques de l'*Agropyrum junceum* (L.) P.B. [Observations on some species and hybrids of *Agropyrum* II. On the geographical distribution of karyological races of *A. junceum* (L.) P.B.].

Bull. Soc. Bot. Fr. 1938 : 85 : 175-79.

The distribution of a form of *A. junceum* ($2n = 42$) round the shores of the Mediterranean has justified the formation of a sub-species, *mediterraneum*.

285. PARDI, L. 633.289:576.312.35:576.356.5
Il numero dei cromosomi dell'*Agropyrum junceum* P.B. del litorale atlantico e del litorale mediterraneo. (The chromosome numbers of *A. junceum* P.B. of the Atlantic and the Mediterranean coasts).

Nuovo Giorn. Bot. Ital. 1938 : 44 : 645-51.

The forms of *Agropyrum junceum* occurring on the Atlantic coast of Europe and on the coasts of the North Sea are tetraploid ($2n = 28$). Forms found on the shores of the Mediterranean are hexaploid ($2n = 42$). The botanical differences between the two groups are described.

286. KREUTZ, H. and
SCHELHORN, M. v. 633.3:575 "793"
Über Züchtungsversuche bei winterannuellen Hülsenfruchtern. (Breeding experiments with annual winter leguminous crops).

Franzenbau 1938 : 15 : 99-117.

The aim of the experiment was the breeding of winter-hardy strains of winter peas and various species of winter vetches.

A large number of crosses was made between species of vetch, most of them unsuccessfully. Differences in chromosome number do not appear to be the cause as even crosses between

species with the same chromosome number did not succeed. Resistance to frost and glucose content appear to be closely connected and the winter forms have always a higher glucose content than spring forms.

Besides winter-hardiness in peas, good vegetative development, early flowering and good yield of seed were desired. As a result of experimentation satisfactory winter-hardy types of *sativum* and *arvense* have been produced.

A strain of *Vicia sativa* with considerably increased winter-hardiness has been bred. A soft-shelled strain of *Vicia villosa* from Rumania was found and should prove of value for breeding.

From the numerous crosses made it should be possible to select further valuable forms.

287. HÜBNER, R. 633.35:581.48:575
 Untersuchungen über die Hartschalligkeit der Zottelwicke und ihre Behebung auf züchterischem Wege. (**Investigations on the "hard seeds" of the hairy vetch and their elimination by breeding methods.**)
 Landw. Jb. 1938 : 85 : 751-89.

Investigation of four varieties of the hairy vetch as well as of a variety of Hungarian vetch showed that hard seed was a varietal character. No relation between hard seed and size of seed could be established.

For breeding purposes four groups of plants were grown: - (1) Plants from soft seeds from hard-seeded mother plants. (2) Plants from hard seeds from hard-seeded mother plants. (3) Plants from hard seeds from soft-seeded mother plants. (4) Plants from soft seeds from soft-seeded mother plants.

The more hard-seeded their origin, the more hard-seeded were the resulting plants so that most soft-seeded plants came from Group 4. Details are given of the method of testing for the hard-seeded character.

288. TROLL, H.-J. and 633.367:575.172.3
 SCHANDER, H.
 Pleiotrope Wirkung eines Gens bei *Lupinus luteus*. (Neuzucht "Weiko").
 [Pleiotropic action of a gene in *L. luteus*. (New strain "Weiko")].
 Züchter 1938 : 10 : 266-71.

A white-seeded mutant was found in Strain 8, an alkaloid-free form of *L. luteus*. Besides having white seeds, the mutant had no development of anthocyanin in cotyledons, leaves and stems; the keel was yellow instead of black, there was a deficiency of colour in the pod sutures and the thousand grain weight was less. The mutation is attributed to the presence of the recessive gene *niv* and the new form is named Weiko.

In addition to its morphological characters the new strain shows certain distinguishing physiological characters which make it of real value for breeding purposes.

It is less sensitive to excess of calcium than the normal strain, but more sensitive to standing water; the flowering period begins later but the yield-capacity is increased and as forage its digestibility is higher.

289. FISCHER, A. 633.367:576.16:575
 Über die Herkunft züchterisch wichtiger Lupinenarten. (**On the origin of species of lupin of importance for breeding.**)
 Forsch. Fortschr. 1937 : 13 : 347-48.

The three species of lupin most important for German agriculture, *Lupinus luteus*, *L. angustifolius* and *L. albus*, originate from the countries bordering on the Mediterranean. *L. mutabilis* and *L. perennis* come from South and North America respectively. A closer investigation of the wild forms would probably show that these possess valuable qualities for further breeding work such as earliness, luxuriant growth and increased protein, oil and fibre content.

290. SENGBUSCH, R. v. and ZIMMERMANN, K. 633.367:581.47:575.42:551.56
 Meteorologische Grundlagen für die Auslese und Prüfung von Lupinen mit nichtplatzenden Hülsen. (*Lupinus luteus* und *Lupinus angustifolius*). [Meteorological basis for the selection and testing of lupins with non-splitting pods. (*L. luteus* and *L. angustifolius*)].
 Züchter 1937 : 9 : 225-31.

The climate of Müncheberg often proved unsatisfactory when selecting strains of lupin for the non-splitting habit. Data are here given of the climatic conditions in Germany showing which districts combine the necessary factors of temperature, relative humidity and cloudiness. No satisfactory method of laboratory testing was found.

291. HACKBARTH, J. 633.367:581.47:581.192.6:575.11
 Über die Züchtung platzfester gelber Süßlupinen und die Vererbung der Platzfestigkeit. (On the breeding of non-splitting, yellow sweet lupins and the inheritance of the non-splitting habit).
 Züchter 1938 : 10 : 263-66.

Each of the characters, white grain, alkaloid-freedom and non-splitting pods is controlled by a single recessive gene. It is therefore possible to combine them and it is hoped in a few years to put non-splitting yellow sweet lupins on the market. There is a linkage of 44 per cent between the gene for alkaloid content and the "non-splitting" gene.

292. SENGBUSCH, R. v. 633.367:581.47:581.192.6:575.11
 Die Vererbung der Eigenschaft "Nichtplatzen" von Stamm 3535A (*Lupinus luteus*) und die Möglichkeiten der Züchtung von Süßlupinen mit nichtplatzenden Hülsen. [The inheritance of the "non-splitting" character of strain 3535A (*L. luteus*) and the possibilities of breeding sweet lupins with non-splitting pods].
 Züchter 1938 : 10 : 219-20.

The results of breeding work in 1938 have shown that the recessive character of the non-splitting type, already reported (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 520) is due to a single gene.

The cross was made between a pale-seeded, non-splitting type and a dark-seeded splitting type. There was no linkage between seed colour and the pod character or between the alkaloid-free condition and seed colour. The alkaloid-free condition and non-splitting are also independent characters.

293. SENGBUSCH, R. v. 633.367:581.47:581.192.6:575.11
 Züchtung von gelben Lupinen mit nichtplatzenden Hülsen. (Breeding yellow lupins with non-splitting pods).
 Mitt. Landw. 1938 : 53 : 7-8.

A short account of the breeding of alkaloid-free lupins with non-splitting pods. For a more detailed account see Abst. 292 above.

ROOTS AND TUBERS 633.4

294. AGAPOV, S. P. 633.41:575(47)
 (The pedigree variety of table beet No. 0237).
 Itogi Rabot Po Seleksii Ovočnykh Kul'tur Gribovskoi Stantsii (Summary on vegetable breeding of the Gribovo Station No. 1).
 Sel'khozgiz, Moscow 1935 : 15-42.

The production of the variety Bordeaux No. 0237 by mass selection at the Gribovo Station is described. Further breeding work has consisted in selection for greater uniformity of colour, by which means it has been possible to reduce the number of plants with white rings very materially, though absolute constancy has not yet been obtained, owing to the complex

hereditary nature of root pigmentation. The products of selection are superior to other varieties such as Egyptian, Eclipse and Detroit in root weight, yield, absence of lignification and rapidity of root development (earliness). The typical root is rounded in form, and greater uniformity in this respect has also been achieved. Roundness appears from the results to be a recessive character.

A full description is given of the variety, which is suitable for cultivation under a wide range of climatic conditions.

A set of 23.2 per cent was obtained by self-pollination and no signs of degeneration were observed in the process. The progenies of some of the more fertile plants were also of more than average fertility.

- 295. OKANENKO, A. S.** **633.41:575.127:581.192**
(On the biochemical characteristics of some sorts of beetroot).

Bull. Acad. Sci. U.R.S.S., Sér. Biol. 1937 : 1870-901.

Varietal differences in sugar content in the leaves were observed.

Hybrids between sugar beet and forage beet were grown under different conditions of manuring. The hybrid gave a higher yield than the two parents in the normal manuring but under intensive conditions it was inferior to the forage parent, though superior to (i.e. more responsive than) the sugar beet.

The sugar content of the F₁ was slightly above the arithmetic mean of the parents. The proportion of monosaccharides to saccharose in the crown and the vascular bundles was very high in the forage beet as compared with the sugar beet; in the hybrid it was low, being only 100 per cent higher than that in the sugar beet, and 500 per cent lower than the forage parent. In the parenchyma on the other hand, the monosaccharides were intermediate between the parents. The reserve carbohydrates were high in the F₁ as also in the sugar beet. The intensive manuring increased the amount of monosaccharides more in the hybrid than in the parents. Catalase activity of the hybrid was as low as in the forage parent, its invertase activity was closer to that of the sugar beet.

F₁ hybrids between chard and Dewing table beet were also examined; in root weight, sugar content, dry weight and number of vascular rings they exceeded both parents. The content of monosaccharides was similar to that of the parents; the saccharose content, both of the whole root and particularly of the vascular bundles and parenchyma, was double. The reserve carbohydrates were 50 per cent higher than in the richer of the two parents. The distribution of the sugars was the reverse of that in the forage beet, the parenchyma containing more than the vascular bundles. In invertase activity the hybrid was inferior to both parents, while in catalase activity it was superior.

From these results the chard is thought to be a useful parent in sugar beet breeding.

- 296. SCHWANITZ, F.** **633.41:576.356.5:581.04**
635:576.356.5:581.04
Die Herstellung polyploider Rassen bei Beta-Rüben und Gemüsearten durch Behandlung mit Colchicin. (Vorläufige Mitteilung). [The production of polyploid races of beets and other vegetables by treatment with colchicine. (Preliminary communication)].

Züchter 1938 : 10 : 278-79.

Polyplloid plants were obtained from a number of varieties of beet by treatment with colchicine. Polyploidy had no effect on self-sterility.

In the experiments with various varieties of vegetables it was noted that some species required a higher dosage than others.

Chinese cabbage, radish, cress, spinach, chervil, borage, rampion, lettuce, endive, peas and lupins were treated and with the exception of the leguminous plants, very considerable numbers—up to 90 per cent—of polyplloid plants were obtained.

The treatment of plants of cabbage and Brussels sprouts also produced polyplloid races but the fertility of the polypliods was always more or less reduced and the diploid plants always flowered first.

297. POPOFF, A. 633.416:575.255:576.356.5
 Chimärenbildungen bei der Futterübe. (**Chimaera formation in the forage-beet**).
 Züchter 1938 : 10 : 210-12.

The investigation was undertaken with the hope of finding cytological differences between normal beets and the so called "fizzlers." The variety "Eckendorfer Gelbe" was used. No differences could be detected, but it was observed that a considerable number of the plants of both kinds had tetraploid rootlets. These tetraploid areas appeared to be due to fungal attack and it is suggested that the production of a tetraploid strain of forage beet by artificial means might be of economic value.

298. GREBINSKAYA, M. I. 633.42:575.129:635.15:581.4
 (**The anatomy of the amphidiploid *Raphanobrassica* and its parents**).
 J. Bot. U.R.S.S. 1938 : 23 : 106-21.

A detailed morphological study was made of Karpechenko's *Raphanobrassica* and of the two parents, as a result of which it was shown that the characters of the cabbage were predominant in the stem, root, fruit and seed. In the leaf, the suberized cells of the hypocotyl and the starch grains, the characters were intermediate and in certain other characters, such as the epidermal cells of the leaflets, the radish type predominated.

The amphidiploid was characterized by larger cell size in many organs; the chloroplasts are on the other hand smaller. Certain structural anomalies resulting from lack of balance were also detectable, and many characters were distinct from either parent.

299. SCHRÖCK, O. 633.42:581.192.6:575
 Die Züchtung senfölfreier Stoppelrüben (*Brassica Rapa* var. *rapifera* Metzger). [**The breeding of turnips (*B. Rapa* var. *rapifera* Metzger) free from mustard oil**].
 Züchter 1938 : 10 : 276-77.

Methods are described for the detection of mustard oil in turnips. By these means, six turnips have been isolated which repeated investigations have shown to be free from mustard oil. A study of the progenies of crosses between these plants is being made with special reference to the relation between mustard oil content and resistance to *Plasmodiophora brassicae*.

300. FRIEDL, G. 633.425-2.111-1.521.6
 633.425:581.143.26
 Oberkohlrabi—"Roggis Freiland". (**"Roggis Freiland" kohl rabi**).
 Obst- u. Gemüseb. 1938 : 84 : 117-18.

Mainly an account of the cold resistance tests in which this variety excelled. It was also remarkable in the absence of bolters and the formation of very large "roots" of highly palatable quality.

301. MORINAGA, T. and KURIYAMA, H. 633.426:576.356.5
 On the autopolyploids of the rape.
 Cytologia, Tokyo 1937 : Fujii Jubilee Vol. : 967-69.

Seventy-nine individuals were obtained from seed collected from partly sterile diploid rape plants. Three of them proved to have approximately the triploid and one approximately the tetraploid chromosome number. It is suggested that these plants were autopolyploids resulting from the functioning of diploid gametes.

302. KOMATSU, T. 633.426:576.356.52:576.356.1
 (**Investigations in progeny of haploid plants and embryo-sac formation by diploid and haploid plants of *Brassica napus***).
 Proc. Crop. Sci. Soc. Japan 1936 : 8 : 364-72.

The genome structure of the haploid of *B. napus* ($n = 19$) is represented by *ac* and can be regarded as equivalent to the F_1 of hybrids between genome *a* plants ($n = 10$) and genome *c* plants ($n = 9$). Examination of 1275 offspring of haploid plants in general confirmed the

results of Morinaga and Fukushima. The majority of the plants were normal diploids but among 736 plants from a haploid x diploid cross three irregular forms with $2n - 2$, $2n + 5(?)$ and $2n - 9(?)$ chromosomes were observed, while among 539 plants from a diploid x haploid cross there were 2 plants with $2n - 2$ and one with $2n + 5(?)$ chromosomes. Though the percentage of morphologically perfect pollen in such anomalous progeny ranged from 85-90 per cent, the fertility was poor.

The writer found that non-reduction of the chromosomes occurred in embryo-sac formation in the haploids and he attributes the origin of the $2n - 2$ plants to the occurrence of unreduced gametes in which two chromosomes had been expelled from the nucleus. He believes the formation of *a* and *c* gametes must be rare.

Embryo-sac formation in diploid and haploid plants is also discussed. Out of 114 ovules examined in haploids, 90 showed no embryo-sacs.

303. SUN, V. G. 633.426:581.162.31

Self-pollination in rape.

J. Amer. Soc. Agron. 1938 : 30 : 760-62.

Sufficient seed for carrying on selection in selfed lines can be obtained simply by bagging the inflorescence, though a much better set is obtained by bud pollination. Removing the terminal bud did not appear to influence seed setting favourably. There is some evidence that, at least in a red-seeded line, the greatest set from selfing is obtained in the middle of the flowering season.

304. HERRERA, F. L. 633.491(85)

Variedades de papas cultivadas en el Cuzco. (Potato varieties cultivated in Cuzco).

Bol. Direcc. Agric. Ganad., Lima 1931 : 1 : 281-84.

The varieties of potatoes cultivated by the natives are classified on the basis of certain tuber characters. These are shape, colour of skin and flesh, edibility and cooking quality.

A few wild varieties, weeds of cultivation, are also mentioned.

J. G. H.

305. FITCH, C. L. 633.491:575(73)

A report upon Federal and State potato breeding in the United States.

Trans. Ia Hort. Soc. 1937 : 72 : 323-31.

The organization and activities of the United States potato-breeders are briefly described.

306. KRANTZ, F. A. 633.491:575(73)

Progress in breeding improved varieties of potatoes.

Minn. Hort. 1937 : 65 : p. 65.

No important new potato variety was produced in the United States between 1886 and 1931, a period of nearly fifty years. One cause of the stagnation was that all the important varieties available were male-sterile, and the few forms which had viable pollen were unsatisfactory parents. This situation was finally overcome by crossing American varieties with European varieties with viable pollen, and crossing together selected seedlings derived from these crosses. The Chippewa and Katahdin varieties were produced in this way by W. Stuart. At the Minnesota Station, the method employed is to select self-fertilized lines, which are finally crossed. A great deal of breeding material is now available, and it seems likely that the standard potato varieties in the States will soon be replaced by better ones.

307. WERNER, H. O. 633.491:575(78.2)

Breeding potatoes in the greenhouse.

Trans. Ia Hort. Soc. 1937 : 72 : 339-40.

By growing potatoes under the coolest possible conditions and artificially increasing the day length to 16 hours, the author has succeeded in inducing flowering and seed setting of potatoes in Nebraska and has made some crosses. It is hoped to produce heat-resistant varieties, early varieties and for the commercial section in western Nebraska, a red variety which will not crack as badly as Triumph at harvesting.

308. *EMME, E. K. 633.491:575.11:576.16
(Solanum Rybinii Juz. et Buk., S. stenotomum Juz. et Buk. and S. goniocalyx Juz. et Buk. Importance in breeding and phylogenetic relationships. Genetical study III.).
 Biologičeskii Žurnal (Biologicheskij Zhurnal) 1937 : 6 : 787-96.
 The economic, botanical and agricultural features of *S. Rybinii*, *S. goniocalyx* and *S. stenotomum* are mentioned with a brief citation of data on hybrids of *stenotomum* x *goniocalyx*.
 The writer then describes various 24 chromosome hybrids (including back-crosses as well as the F_1 and F_2 generations) from different combinations of the above three species.
 Germination capacity was reduced in all the crosses. Transgressive segregation for leaf shape occurred though the parent types too were represented.
 Segregation for corolla in the *Rybinii* x *goniocalyx* cross was not inconsistent with the formula already established for *Rybinii*, an^{sp} an^{sp} *Cr cr*. The F_1 and F_2 from *Rybinii* x *stenotomum* showed the latter species in this cross to be of the constitution An^{sp} an^{sp} *Cr Cr*. The F_1 and F_2 from the cross *stenotomum* x *goniocalyx* suggest that An^{sp} an^{sp} *Cr cr* x An^{sp} An^{sp} *cr cr* are the formulae underlying this cross.
 In *Rybinii* the calyx is small and almost radially symmetrical, whereas in *goniocalyx* it is large and very asymmetrical. In F_1 and the back-cross, segregation for this character occurred, but in general the calyx resembled that of *goniocalyx*. In the F_1 of *Rybinii* x *stenotomum* the calyx was on the whole like that of the latter species.
Rybinii pollen showed normally plump grains; in *goniocalyx* there were 10 per cent of aborted grains and abortion also occurred in *stenotomum*. F_1 , F_2 and the back-cross seedlings from *Rybinii* x *goniocalyx* showed almost normal pollen (90-93 per cent). Though the percentage of normal pollen in the *Rybinii* x *stenotomum* F_1 was 96, very few berries were set by either natural or artificial selfing. In F_2 one seedling had 78 per cent normal grains; but there was no set of berries.
 Some segregation ratios for tuber colour in various crosses at different centres are given. About 50 to 60 per cent of the seedlings formed tubers, which were scarcely of marketable size and the clusters in general lacked uniformity. Tuber formation under long day conditions was apparently a complicated recessive character in the three species in question. Elongated tubers were recessive in the cross of *Rybinii* with *goniocalyx* and dominant in *Rybinii* with *stenotomum*. Round tubers were dominant in *stenotomum* x *goniocalyx*.
 Segregation in the F_1 of *Rybinii* x *stenotomum* suggested that the latter species was heterozygous for the presence of "eyebrows". All the F_1 , the back-cross and F_2 were deficient in disease and frost resistance. The comparative resistance of *Rybinii* to mosaic (under field conditions) appears to be recessive. From visual inspection the hybrids from the back-cross with *Rybinii* seem to be more resistant under field conditions.
 The phylogenetic relationships of the three species are also discussed.
309. PROPACH, H. 633.491:575.12:581.162.5
 Kreuzbarkeit von *Solanum*-Arten untereinander und mit Kulturkartoffeln und die Fertilität der Bastarde. (The crossability of *Solanum* species with each other and with cultivated potatoes and the fertility of the hybrids).
 Forschungsdienst 1938 : 6 : 311-14.
 The reason why species of potato will cross readily with some species and not with others cannot be explained by their chromosome number, their systematic relationships or their geographical origin.
 Other anomalies are noted with regard to the fertility of the hybrids. In spite of good pollen the results are frequently disappointing. So far there is no adequate explanation for these results.

* An extended summary of this paper is on file at the Bureau.

310.

PROPACH, H.

Cytogenetische Untersuchungen in der Gattung *Solanum*, Sect. *Tuberarium*. IV. Tetraploide und sesquidiploide Artbastarde. (Cytogenetical studies on the genus *Solanum*, sect. *Tuberarium*. IV. Tetraploid and sesquidiploid species hybrids).

Z. indukt. Abstamm- u. VererbLehre 1938 : 74 : 376-87.

The F_1 hybrid *Solanum acaule* x *S. antipoviczii* (both tetraploid species) had 0-5 quadrivalents per cell. The frequency distribution of uni-, bi-, tri- and quadrivalents in this cross closely corresponds to that in autotetraploid *Lycopersicum esculentum*, and the author concludes that the chromosome sets of the two species are substantially similar. At least one structural change differentiates the two parents, however, as a chromatin bridge occurred in about 5 per cent of the cells.

Fifty-four plants were obtained from the cross *S. chacoense* ($n = 12$) x *S. tuberosum* ($n = 24$), but of these, only seven were retained for cytological examination. All these proved to be tetraploid, and had presumably arisen as the result of fertilization of diploid egg cells of *S. chacoense*. In the F_1 there were usually 24 bivalents, but occasional quadrivalents (1-3) also occurred. It is not definitely known whether the pairing was allosyndetic or auto-syndetic.

Sterile and fertile plants were found in this cross, but no difference in chromosome pairing was observable between the two categories. The sterility is probably due to a specific gene or genes.

311. TKAČENKO, P. I. 633.491:575.247
(Agricultural value of vegetative mutations of potato).
 Seleksija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 6 : 35-36.

At the Soviet Potato Institute 250 somatic mutations of the potato have been detected; fifty to sixty of the best were tested in 1934 and succeeding years and the majority of them proved to be little or not at all inferior to the parent varieties and certain mutants were distinctly superior in respect of earliness, yield or starch content. Artificial mutations are now to be studied.

312. KAGAWA, F. 633.491:575.255:576.356.5
Chromosomal chimeras and polyploidy in *Solanum gracile* Link.
 Cytologia, Tokyo 1937 : Fujii Jubilee Vol. : 733-44.

Young plants of *Solanum gracile* were decapitated, and out of 80 adventitious shoots which developed from the callus two proved to be chromosomal chimaeras consisting partly of tetraploid and partly of diploid tissue. It is noted that such chimaeras may generally be expected to arise from such a callus. Plants showing the tetraploid chromosome number which develop from seed collected on tetraploid parts of the chimaera will, however, be true tetraploids.

The course of pollen formation in tetraploid anthers and in a triploid plant was studied. Morphologically perfect pollen grains of the diploid had 3, occasionally 2, germ pores and a mean diameter of 26.2μ . Similar grains from the triploid had 3 to 4 germ pores and a mean diameter of 27.7μ . Tetraploid pollen grains had 4 germ pores (sometimes 3, or rarely 5) and a mean diameter of 31.9μ .

Both triploid and tetraploid anthers showed multivalents at meiosis, had highly irregular anaphase separations and a high percentage of bad pollen.

313. *ŠEPELEVA, E. M. 633.491:576.312.34
(The morphology of the chromosomes of certain species of the potato).

C. R. (Doklady) Acad. Sci. U.R.S.S. 1937 : 15 : 207-09.

A detailed description of the types of chromosomes in the 24 chromosome species. *Solanum*

* A translation of this paper is on file at the Bureau.

These factors are being incorporated in crosses to act as an aid in detecting contamination of seed stocks.

Work on the control of cotton root rot is described and there is also a brief description of work on barley, wheat, sorghum, maize, flax, citrus fruit, dates, and certain other crops.

321. TAVARES, H. 633.51:575.123

O tabú do hibridismo. (**The taboo on hybridity**).

Bol. Sec. Agric. Industr. Com. Pernambuco 1937 : 2 : 415-17.

An exaggerated importance is placed on the purity of a variety and provided that a given variety, say of cotton, is pure and uniform in respect of the main industrial characters for which it is cultivated, a certain degree of fluctuation in other characters is not prejudicial, and may indeed be advantageous in providing a greater degree of adaptability to changes in external conditions. In arboreal cottons such as Mocó, which can be propagated by grafting, and where heterosis may play a part, a certain degree of heterozygosity is definitely desirable.

322. PRESSLEY, E. H. 633.51:575.183:677.1

A study of the effect of pollen upon the length of cotton fibers.

Tech. Bull. Ariz. Agric. Exp. Sta. 1937 : No. 70 : 255-92.

Since cotton plants are selected by the breeder partly on the basis of lint length under conditions of open pollination, it is important to know whether foreign pollen may have a direct effect in influencing the character.

Comparable hybrid and selfed seeds were obtained in the same boll by applying a mixture of pollen and subsequently separating them by genetical means.

Hybrid seed from the crosses Red Acala ♀ x Delfos ♂ and Red Acala x Pima ♂ produced lint of the same length as comparable selfed seed. Hybrid seed from the two reciprocal crosses bore lint $\frac{1}{128}$ inch longer than selfed seed. This difference is too small to influence either selection by the breeder or the value of the crop.

Weight of seed, position of boll on plant, and plant-to-plant differences had a much greater effect on lint length.

323. WEBBER, J. M. 633.51:581.481:576.356.52

Cytology of twin cotton plants.

J. Agric. Res. 1938 : 57 : 155-60.

In the past three years four pairs of twin cotton plants have been observed by the author. One pair of twins occurred in Acala cotton (*Gossypium hirsutum*) and was diploid-diploid, with regular meiosis except for occasional quadrivalents. A second diploid-diploid pair of twins was obtained in the F₂ of a hybrid between *G. nanking* Meyen (n = 13) and *G. thurberi* Tod. (n = 13); the two plants were conjoined and died at an early stage. A haploid-diploid pair was obtained in *G. barbadense* (Cf. also "Plant Breeding Abstracts", Vol. VII, Abst. 229). The diploid member had regular meiosis except for occasional quadrivalents and univalents while the haploid had 26_I in 22 cells, 1_{II} + 24, in one cell and 2_{II} + 22_I in two cells. The plant has been maintained for three years during which time it has set three open-pollinated and one selfed seed, no success having been obtained in crosses. The selfed seed gave a diploid plant with meiosis similar to that of the diploid twin of its parent.

Of the fourth pair of twins one member died and the other was diploid. This pair occurred in the same culture as the preceding pair.

324. 633.51-2.3:575(47)

(**Abstract of the investigations of the Plant Protection of the Pan-Soviet Institute for Scientific Research on Cotton**).

Plant Protection, Leningrad 1937 : 15 : 99-112.

This is a collection of papers by various authors on the control of blackarm (*Bacterium malvacearum*) of cotton. Control by seed disinfection, hot-water treatment of the seed, and bacteriophage treatment in combination with vernalization is discussed.

A number of Old World 13-chromosome cottons proved to be absolutely immune to *Bacterium malvacearum* when artificially inoculated. The cottons usually grown in the U.S.S.R. are, however, in the 26-chromosome group. Recent investigations indicate that it may be possible to breed immune hybrids between the two groups.

325. NEAL, D. C. and 633.51-2.484-1.521.6:575.42
HADDON, C. B. 633.51 Delfos 2323-965-425

A promising wilt-resistant long staple cotton.

J. Amer. Soc. Agron. 1938 : 30 : 644-46 ; also Phytopathology 1938 : 28 : p. 666. (Abst.).

The new strain, Delfos 2323-965-425, is derived from a single resistant plant of Delfos 2323-965 selected in the field in 1934. It is highly resistant to *Fusarium* wilt, gives a good yield, with uniform fibre length of $1\frac{1}{8}$ to $1\frac{3}{16}$ inches and 32.5 per cent lint.

326. RICHMOND, T. R., 633.51:677.1:575.11.061.6
HARPER, R. E. and
KILLOUGH, D. T.
Notes on the progeny of a brown lint by green lint cross of Upland cotton.
Proc. 39th Annu. Convent. Ass. S. Agric. Wkrs, Atlanta, Ga 1938 : 64-65.
(Abst.).

On the basis of F_2 and back-cross data, it appears that the characters brown lint and green lint in Upland cotton, are independently inherited. Each is due to a single, incompletely dominant gene.

The factor *K* for brown lint also gives brown seed fuzz, the heterozygote *Kk* having intermediate brown fuzz. The factor *G* for green lint gives green fuzz, whether it is in the homozygous or heterozygous condition.

In addition, there is a third factor *gf* which has no effect on lint colour, but which gives green fuzz when in the homozygous recessive condition. The effect of this factor is masked in the presence of the factor *G*.

327. SCHÜRHOFF, P. N. and 633.512:576.312.35
MÜLLER, H.
Zytologische Untersuchungen über die Haploidgeneration der Apocynaceen.
(Cytological investigations on the haploid generations of the Apocynaceae).
Cytologia, Tokyo 1937 : Fujii Jubilee Vol. : 407-15.

The haploid chromosome numbers of some species of the Apocynaceae were established as follows:—*Vinca minor* 16, *V. major* 8, *Rhazya orientalis* 8, *Amsonia tabernaemontana* 16, *Nerium oleander* 8, *Apocynum cannabinum* 8, *A. androsaemifolium* 8, *A. venetum* 8.

328. SENGBUSCH, R. von 633.52.575(43)
Die züchterische Bearbeitung unserer Faserpflanzen. (Breeding activity with our fibre plants).
Umschau 1938 : 42 : 531-33.

A brief account of the aims, methods and results of breeding flax, hemp, nettle and willow.

329. BOERGER, A. 633.52:575.12:633.854.54
Die Entwicklung des uruguayischen Leinbaues unter dem Einfluss von Forschung und Züchtung. (The development of the flax cultivation of Uruguay under the influence of research and breeding).
Faserforschung 1938 : 13 : 185-213.

A full account of the development of the cultivation of flax in Uruguay. The breeding programme includes the testing of various strains, selection for length of stem and hybridization between flax and linseed, from which strains have been produced with a satisfactory yield of seed and sufficiently long stems.

Experiments have also shown the possibility of breeding self-compatible strains.

330. SIMONET, M.,
CHOPINET, R. and
SOUILIJAERT, G. 633.52 : 576.356.5:581.04
Sur l'obtention d'un *Linum usitatissimum* L. tétraploïde après application de colchicine. (On the production of a tetraploid *L. usitatissimum* L. after application of colchicine). 633.854.54:576.356.5:581.04
C.R. Acad. Sci. Paris 1938 : 207 : 85-87.
A description of a tetraploid plant of linseed obtained by treatment with colchicine. It had 30 haploid chromosomes and the partial degeneration of the pollen and the formation of abnormal tetrads indicate that it is an autopolyploid.
331. GRIŠKO, N. N. 633.522:575:577.83
(Breeding new varieties of hemp).
Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1938 : Nos 7-8 : 73-82.
The female plants of hemp are ripe for harvest 30-50 days later than the male plants, which makes mechanical harvesting impossible. An examination of a large number of forms has revealed none with a materially lower proportion of male plants. In 1929 the author therefore started collecting the occasional monoecious plants that occur to the extent of about 10-20 per ha. These plants were then inbred and inter-crossed. Various sexual anomalies were observed in the progenies, including feminized male forms bearing inflorescences of the male type but containing female flowers and conversely, masculinized female forms. Both these types reached technical maturity simultaneously with the ordinary plants of the opposite sex.
Crosses were made between the feminized male plants with ordinary females, which produced a population of plants all of the female type but with varying proportions of male flowers. The segregates were repeatedly back-crossed to female plants, the odd plants that matured too early being discarded in each generation. In this way a strain has been produced in which the male plants are all of the female type and mature simultaneously with them, 3-8 days later than the ordinary type; it contains 60-75 per cent female plants and 25 to 40 per cent male, about 5 per cent of the former and up to 20 per cent of the latter being hermaphrodite. The strain has proved satisfactory under a wider range of cultural conditions, less exacting and at the same time more responsive to improved conditions; this is ascribed partly to its longer vegetation period and partly to its more vigorous root system. Technological analysis has shown the character of the fibres to be very similar in the two sexes; there was greater uniformity in plant height and the yield of first class fibre was 25-60 per cent greater than in common hemp; these facts combined with its suitability for mechanical harvesting make the new strain very promising and it is being rapidly multiplied and distributed to growers. Early maturing forms are now being selected in order to escape attack by *Orobanche* and various pests.
332. HOFFMANN, W. 633.522:577.8
Das Geschlechtsproblem des Hanfes in der Züchtung. (The sex problem of hemp in breeding).
Z. Zücht. 1938 : A 22 : 453-68.
Three ways are suggested for overcoming the difficulties encountered in hemp-breeding due to the dioecious nature of the material.
(1) By a shifting of the sex ratio in favour of the female plants.
Although it is possible by breeding methods to shift the ratio from the 1♂:3♀ found in nature to 1♂:5♀ it is questionable whether this method will in fact help in solving the problem.
(2) The breeding of a strain of hemp in which the male and female plants ripen simultaneously. This is a practical possibility. Forms of male plants with a long-flowering period and the so-called feminized male plants that have the habit of the female plants but bear male flowers are found in nature and Russian workers have already produced strains in which male and female plants ripen together (Cf. Abst. 331).

(3) The breeding of a hermaphrodite or monoecious hemp.

All stages from entirely male to entirely female are found in nature. The proportion of male and female and the number of intersexes varies very greatly in the different strains. External conditions may cause a variation in the proportion of the sexes and intersexes but it is found that the intersex condition produced by changes in the external conditions is not inherited. Other workers have already established that the inheritance of sex in hemp is of the XY type. The inheritance of the intersex type is not yet fully explained.

A discussion of the importance of the intersexes and their inheritance shows that it is possible to breed a monoecious race of hemp.

333. FORD, C. E.

633.524.3:576.312.35

A contribution to a cytogenetical survey of the Malvaceae.

Genetica 1938 : 20 : 431-52.

Chromosome numbers of 32 species from 13 genera are reported, including the following: *Abutilon asiaticum* $2n = 14$, *A. auritum* Sweet $2n = 14$, *A. graveolens* $2n = 14$, $n = 7$, *A. hirtum* $2n = 14$, *A. molissimum* $2n = 14$, *A. pauciflorum* $2n = \text{ca. } 42$, *A. Theophrasti* $n = 21$, *Hibiscus angulosus* $2n = 56$, *H. cannabinus* $2n = \text{ca. } 72$, *H. collinus* $2n = 42$, *H. costatus* $2n = 36$, *H. diversifolius* $n = \text{ca. } 72$, *H. esculentus* $n = \text{ca. } 66$ in one strain $2n = \text{ca. } 66$ in another, *H. peduncularis* $2n = \text{ca. } 72$, *H. vitifolius* $n = 33$, *H. Trionum* $2n = 28$, *Gossypium Armourianum* $2n = 26$, *G. Harknessii* $2n = 26$.

Observations are made on a specific variation in chromosome number and on the probable basic number in the different tribes.

334. MEDVEDEVA, G. B.

633.524.35:576.312

(Karyological review of 15 species of the genus Hibiscus).

J. Bot. U.R.S.S. 1936 : 21 : 533-50.

A great deal of confusion exists as regards the systematics of the species of the genus *Hibiscus* and an examination of the scanty literature on the cytology of the genus reveals an equal state of discord. Somatic counts were made on fifteen species belonging to six different sections of the genus and the results are here described. On the basis of these results certain alterations in the systematic position of some of the species are suggested and probable cases of polyploidy are pointed out. There is a great variation in karyotype within the genus, which suggests that it is polyphyletic and that interspecific crossing will be difficult and unprofitable.

335. USTINOVA, E. I.

633.524.35:581.162.32

(Cross pollination in Hibiscus cannabinus).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 6 : 32-33.

Plants belonging to five distinct botanical varieties were sown in contiguity and their progeny examined for hybrid plants. The results are tabulated and show that the varieties differ in their tendency to natural crossing, being least in *H. cannabinus* var. *viridis* L. from Java, which produced no hybrids and highest in var. *vulgaris* where cross-pollination varied from 2·58 to 39·2 per cent in different forms.

The various factors that cause the *Hibiscus* flower to be prone to pollination by insects, mainly bees, are enumerated and the bearing of these findings on breeding methods is mentioned.

336. SHARONOV, V. A.

633.525.1:575.12

(Close and remote crossings in ramie).

Soviet Subtropics 1938 : No. 1 (14) : 56-59.

The floral biology of ramie and the most suitable methods of cross-pollination are described. A great many crossings have been effected between different forms of ramie and also with different species of *Boehmeria* and with *Urtica*. Some of the F_1 hybrids were of a very desirable practical type, being late in maturity, tall and unbranched. Interspecific hybrids have so far all been of the maternal type. One plant combining some ramie characters and some nettle characters has been obtained by crossing with *Urtica*.

337. VIGNOLI, L. 633.526.2:576.31:576.356.5
Grandezza cellulare e poliploidia in *Agave*. (Cell size and polyploidy in *Agave*).
Lav. R. Ist. Bot. Palermo 1937 : 8 : 88-106.

The observations were made on the cells of the leaves of ten species of *Agave* with somatic chromosome numbers ranging from 60-180.

The data show that the cell size increases with the increase in the number of chromosomes. *A. Zapupe* and *A. sisalans* are exceptions, the volume of their cells and the dimension of their stomata are relatively low and probably not in proportion to the increase in nuclear material. If the length of the flower is considered then there is an increase in length up to the tetraploid, *A. Salmiana*, after which the length decreases until in the hexaploid species it about equals that of the diploids. The xerophytic character is observed to increase with the increase in chromatin.

338. VIGNOLI, L. 633.526.2:576.356.5:581.162
Cariologia del genere *Agave*. II. (Karyology of the genus *Agave*. II).
Lav. R. Ist. Bot. Palermo 1937 : 8 : 1-3.

The flowers of *A. Ghiesbreghtii* C. Koch. while still in bud in February showed a curious anomaly. The flowers of the upper half of the inflorescence were normal, most of those of the lower half were partly open and the anthers and stigmas were exposed to the air. Meiosis in these abnormal flowers was irregular leading to polyspory. In the normal flowers a haploid chromosome number of 90 was observed.

The other species of *Agave* examined also had 90 chromosomes but it was not possible to classify it further than to place it in the section *Brachysolenagave*.

SUGAR PLANTS 633.6

339. TISSOT, P. 633.61:575(41)
Travaux récents sur la sélection de la canne à sucre dans les colonies anglaises. (Recent work on sugar cane selection in the British colonies).
Rev. Bot. Appl. 1937 : 17 : 110-22.

A survey of the organization of sugar cane research in the British Empire, with a summary of the practical results achieved.

It is pointed out that scientific improvement of the crop, together with preferential tariffs, have enabled cane sugar production in the Empire to increase since 1929, while world production has actually fallen. The increase has been almost entirely at the expense of Java and Cuba.

340. CERESA, G. 633.61:575(72.91)
Genetical notes on sugar cane (3rd Contribution).

Proc. 11th Annu. Conf. Asoc. Tecn. Azucareros Cuba 1937 : 183-93.
Concluding the series (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 703) notes are given on some 26 varieties, mostly from Java.

341. CONANT, R. K. 633.61:575:578.08
Some important factors to consider in selecting seedlings.
Hawaii. Plant. Rec. 1937 : 41 : 307-18.

The interests of workers in the field and in the mill are shown to be divergent and often contradictory. Costings are given for canes of various types, in an attempt to illustrate how far it is profitable in selection work to consider juice at the expense of other features such as vegetative vigour, size of stalks and ease of cultivation and loading.

342.

TISSOT, P.

633.61:575.127.5:633.174

Les hybrides canne à sucre x sorgho. Leur intérêt au point de vue de la sélection. (**Sugar cane x sorghum hybrids. Their interest from the point of view of selection.**)

Rev. Bot. Appl. 1937 : 17 : 757-62.

The production of sugar cane varieties with a short growing period is very desirable, as this would make possible a better use of the labour and so reduce the cost of production. Such forms cannot be obtained by hybridization between known varieties of sugar cane and crossing with rapidly-maturing forms of closely related species and genera must be resorted to. *Saccharum* x *Erianthus* hybrids have proved to be of no practical value. Promising *Saccharum* x *Sorghum* hybrids have, however, been obtained at Coimbatore and in the United States. Some of these mature in 5 to 6 months, and have high sugar content and quality, but give very low yields. They form promising material for further breeding and selection. The chromosome number in F_1 sugar cane x *Sorghum durra* hybrids is 64, 74 or 114; the parental numbers being 53-54 and 10.

343.

633.61:576.312

Verslag der cultuurafdeeling van het Proefstation voor de Java-Suiker-industrie te Paseroean over het jaar 1937. (**Report of the crop section of the Experiment Station for the Java Sugar Industry at Paseroean 1937.**)

Jversl. Veer. Proefst. Java-Suikerind. 1937 : 9-26.

In this report there is a very brief statistical note on the number of cytological examinations of sugar cane clones carried out in Utrecht and at Paseroean. An application for the registration of a new variety H.V.A.124 by the Handelsvereeniging Amsterdam is also recorded.

344.

NISHIMURA, T. and

HANCE, F. E.

633.61:581.192:578.081

The analysis of plant material for total nitrogen, phosphate and potash. An improved and simplified R.C.M. procedure.

Hawaii. Plant. Rec. 1938 : 42 : 119-23.

A simplified method enabling the operator to make determinations of total nitrogen, phosphate and potash in cane plant material after a single preliminary treatment is described.

345.

LENNOX, C. G.

Sugar cane collecting in New Guinea during 1937.

Hawaii. Plant. Rec. 1938 : 42 : 235-46.

633.61-1.524(95)

633.61:576.16

The centres of origin of the various species of *Saccharum* are very localized and in many cases do not overlap. *S. officinarum* seems to have its centre in New Guinea or the Dutch East Indies; *S. spontaneum* occurs from the Solomon Islands to Afghanistan and North Africa; *S. Barberi* and *S. sinense*, forming a complex group, are centred probably in India; and *S. robustum* in New Guinea. *S. robustum* has, however, also been found in Fiji, Viti Levu, and the Solomon Islands and New Hebrides. The writer thinks it possible that *S. officinarum* has originated as a series of soft rind mutants from *S. robustum*.

An historical outline is given of cane collecting in New Guinea, starting with Cowley in 1895 and including reference to the collection of the cane Badila there in 1896 and *S. robustum* in 1928, and terminating with the expedition of the author, in conjunction with Mr. C. E. Pemberton, to the Mandated Territory of New Guinea in 1937, the results of which are described in some detail. Among the interesting forms collected are *S. robustum* canes with stalks free from pith and leaf sheaths free from spines.

In the plateau country nearly every cane was different and hundreds of different varieties were found. Seedlings from these varieties are now growing in Hawaii and represent almost every possible variation of growth type, some of them being over 17 feet high.

S. officinarum also occurred, being cultivated for chewing, and at least one cane with a Brix of 20-22 and other characters suitable for commercial growing has been discovered. There also occurred a group of canes with large edible tassels used as a vegetable, thought to be a mutant of *S. robustum*.

346. SUMMERS, E. M.,
RANDS, R. D. and
ABBOTT, E. V. 633.61-2-1.521.6:575(73)

Disease resistance tests.

Sug. Bull. N.O. 1938 : 17 : 30-32.

Notes are given on the reaction to diseases and other characteristics of numerous Canal Point selections.

During 1936, a total of 9,185 seedlings were examined but selections were made from only 2,074 of these, 65 being assigned C.P. numbers. From fuzz sent to Houma from the Canal Point Breeding Station in Spring 1937, 7,111 seedlings were established; after inoculation with mosaic in July, 1,138 field selections were made in November. A further 1,900 selections from the 1936 series, made at Canal Point, were received at Houma in the autumn of 1937 and will be available for selections in the autumn of 1938.

347. 633.63

Die Zuckerrübe einst und jetzt. (The sugar beet then and now).

Gebrüder Dippe A.-G. Quedlinburg 1938 : Pp. 40.

This small booklet contains five short articles on the sugar beet and its development, among which the following will be of interest to plant breeders:—

- Thoenes, H. *Einiges über Pflanzenschutz und Immunitätszüchtung.*
(On plant-protection and breeding for immunity).
(pp. 13-18).

A general discussion on the methods of plant protection and where these fail, and the need for breeding immune varieties. The breeding methods are briefly described.

- Becker, G. *Abstammung und Geschichte der Zuckerrübe. (Origin and history of the sugar beet).* (pp. 25-35).

A brief account of the origin of the sugar beet from the wild form, *Beta maritima*, and a history of its development by breeding methods to the product of the present day.

348. BREWBAKER, H. E. and McGREEVY, B. F. 633.63:575

A critical study of family and group breeding methods for sugar beets.

Proc. Amer. Soc. Sug. Beet Tech. 1938 : 42-50. (Mimeographed).

Statistical data on selection are given and the trends of yield, percentage of sucrose and total sucrose of Great Western Commercial sugar beet from 1922 to 1936 are shown. The value of the progeny test is illustrated by a steady increase in yield and total sucrose in this variety after 1925, when progeny test selection was adopted. This increase continued till 1931, since when the variety has not substantially changed, though selection has been continued. It is suggested that selection by the progeny test with open pollination has definite but limited possibilities and that for further improvement it may be necessary to turn to pure line breeding and the production of hybrid seed, as in maize.

349. SIEGUMFELDT, G. H. 633.63:575(48.9)

Research work in Denmark.

Proc. Amer. Soc. Sug. Beet Tech. 1938 : 20-21. (Mimeographed).

Breeding work with sugar beet is mentioned, the name of V. Erhard Frederiksen being associated with the early work.

350. 633.63:575(49.2)
633.63-1.547.4:575.42

**De beteekenis van selectie voor de uitkomsten van de suikerbietenteelt.
(The importance of breeding in the results of sugar beet cultivation).**

Van Zaad tot Suiker 1936 : No. 1 : 2-7.

An outline of the progress in sugar beet breeding in Holland since 1900, showing the great improvement that has been achieved both in yield of roots and in their sugar content and also in the elimination of bolters in the crop.

351. GASKILL, J. O. and
DEMING, G. W. 633.63:575:578.08
633.63-1.421

Wide spacing as an aid in selection.

Proc. Amer. Soc. Sug. Beet Tech. 1938 : 40-41. (Mimeo graphed).

To test the possible advantage of eliminating competition by wide spacing, 32 strains of sugar beet were grown with 10" x 20" and with 40" x 40" spacing in adjoining areas, with eight replications in each spacing. All data from normally spaced plots were based on fully competitive beets (i.e. not adjacent to a gap), but gaps were ignored in the widely spaced plots. Yield and sucrose percentage were both found to be strongly correlated between the wide and normal spacings and moreover the variability of individual beets for weight was much less with the wide spacing; about 24 beets from normal spacing would be needed to make up a sample equivalent in statistical accuracy to a sample of 10 beets from wide spacing.

352. NUCKOLS, S. B. 633.63:575:578.08

Growing of sugar beets in hills free from competition.

Proc. Amer. Soc. Sug. Beet Tech. 1938 : 39-40. (Mimeo graphed).

The author enumerates the advantages to be obtained by spacing plants 40 inches apart in the growing of sugar beet selections for mother beets, and so eliminating competition.

353. OWEN, F. V. and 633.63:575.116.1
ABEGG, F. A. 633.41:575.116.1

List of genetic factors and chromosome map of the R chromosome in Beta vulgaris.

Proc. Amer. Soc. Sug. Beet Tech. 1938 : p. 72. (Abst.) (Mimeo graphed).

Of the 14 pairs of Mendelian factors known in *Beta vulgaris*, 8 are located in one linkage group. The chromosome concerned might be called the *R* chromosome from the factor *R* for red pigment. The group includes factors for self-fertility, for annual habit and for curly-top resistance.

354. BOUGY, E. 633.63:575.127.2

Croisements entre diverses variétés de betteraves. (Crosses between various varieties of beets).

Bull. Ass. Chim. Sucr. 1938 : 55 : No. 3 : Pp. 5.

The sugar content of a number of hybrids from crosses made during the last ten years is tabulated and compared with the average sugar content of the parents. In only one case is the content of the hybrids lower than that of the parents. The highest yielding beets do not always produce high-yielding progeny and differences in root colour have been observed among the progeny of crosses with two plants of Vilmorin A as the maternal parents that were apparently identical. A detailed investigation is to be undertaken of this phenomenon.

355. DOXTATOR, C. W. 633.63:575.127.2

Possibilities of improving cultivated varieties of sugar beets by hybridization with wild types.

Proc. Amer. Soc. Sug. Beet Tech. 1938 : 79-80. (Mimeo graphed).

The prospects of using wild species in breeding work are briefly discussed.

356. DUDOK van HEEL, J. P. 633.63:575.127.2

De kruising van een suikerbiet en een *Beta maritima*. (The crossing of sugar beet and *B. maritima*).

Van Zaad tot Suiker 1938 : No. 5 : 65-72.

Some early publications on inheritance in sugar beet are mentioned, as well as observations already reviewed (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 707) on the probable hybrid origin of sugar beet.

A cross of *B. maritima* by sugar beet is recorded in which biennial forms of *B. maritima* were chosen and the F_2 generation selected to eliminate bolters and then grouped into thick and thin leaved forms, the former being more like *B. maritima* in the main characters and the latter like the sugar beet. The sugar contents were then determined and the best beets used to establish a series of individual strains in each of the above two groups.

The thin leaved group showed a much higher sugar content than the thick leaved one and gave seed superior in germination capacity but also included strains with more bolters. Strains BM 9 and BM 1 from the thick and thin leaved forms respectively are to be carried on. BM 9 had not only a lower sugar content but also a lower root weight and the roots showed much more branching. In the F₃ (in which the number of strains was unfortunately greatly reduced) the strain BM 9b had leaves resembling the *maritima* type much more than *vulgaris* and was inferior to BM 1a as regards branching of the root. By the F₄ (BM 1a1 and BM 9b4) though the latter defect was still evident, the shape had been enormously improved within three generations and a reduction in the number of bolters was also evident. The pronounced anthocyanin coloration typical of *B. maritima* also persisted.

357. SEITZ, F. W. 633.63:575.127.2:576.356.5
 Ein Beitrag zur Artbastardierung von Zuckerrübe mit *Beta trigyna*.
 (A contribution to species hybridization of the sugar beet with
B. trigyna).
 Dtsch. Zuckerindustr. 1938 : 63 : 439-40, 442, 444.

The F₁ of the cross was partially sterile and an F₂ was obtained by back-crossing with the sugar beet parent. The progeny was also partially sterile. Individuals with 27 and 36 2n chromosomes were found. Those with 36 chromosomes are assumed to be the result of self-pollination in the F₁. Some, but not all, of the polyploid hybrids could be distinguished by their larger leaves, etc., and more luxuriant growth. Both 27 and 36 chromosome plants showed a tendency towards the perennial habit of the *B. trigyna* parent. Further investigations on the sugar content, etc., will be published later.

358. COONS, G. H. 633.63:576.16:575.127.2
 633.41:576.16:575.127.2
Wild species of genus Beta.
 Proc. Amer. Soc. Sug. Beet Tech. 1938 : 74-76. (Abst.) (Mimeo graphed).

A classification of the species of *Beta* is outlined and the existing work on interspecific crosses is very briefly reviewed. The possible value of wild species as breeding material is mentioned.

359. ROEMER, T. 633.63:581.143.26:575
 Achtjährige Aufschuss-Prüfungen von 16 Zuckerrübensorten auf dem
 Versuchsfeld Halle a. S. (Eight-year bolting tests of 16 varieties of
 sugar beet in the experimental plots at Halle a. S.).
 Zuckerrübenbau 1937 : No. 4 : Pp. 4.

Experiments showed that there were very considerable varietal differences.

The varieties selected for the highest sugar content showed in general a greater tendency to bolting than those selected for high sugar yield. Great progress has been made in breeding strains resistant to bolting and it is hoped in the future to produce sugar beets practically immune to bolting.

The production of strains that will germinate at a lower temperature so that earlier sowing may be profitable is also an objective.

360. ABEGG, F. A. 633.63:581.143.26:575.11
**The comparative rate of bolting in various crosses between annual
 and biennial strains of beets.**
 Proc. Amer. Soc. Sug. Beet Tech. 1938 : p. 73. (Abst.) (Mimeo graphed).

In the original paper, data are presented on the comparative proportion of bolting in F₁, F₂ and back-cross progenies from crosses of Munerati's annual strain with various biennial selections.

361. OWEN, F. V. 633.63:581.162.51:575.11
The inheritance and utilization of male sterility in sugar beets.
 Proc. Amer. Soc. Sug. Beet Tech. 1938 : p. 73. (Abst.) (Mimeo graphed).

Male steriles with abortive pollen but functional ovules are apparently produced in beet by complementary factors. Crossed with certain strains bearing normal flowers they give all male sterile hybrids. The character may be useful in the production of hybrid seed for the utilization of heterosis.

362. OWEN, F. V. 633.63:581.162.52:575.11
Genetics of self-fertility and self-sterility in sugar beets.
 Proc. Amer. Soc. Sug. Beet Tech. 1938 : 72-73. (Abst.) (Mimeo graphed).
 Three classes are recognized, highly self-fertile, intermediate and strongly self-sterile. The expression of the character is influenced by the environment. Self-sterility is believed to be due to chemical substances in the style preventing pollen tube growth. A single Mendelian factor SF produces self-fertility.
363. BORDONOS, M. G. 633.63:581.46:575
(The type of segregation and certain peculiarities of beet plants with one-seeded seed balls).
 Seleksija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 6 : 24-27.
 The average seed ball, containing 2, 3, 4 or even more seeds, gives rise, when sown, to a group of seedlings, which is for practical purposes a disadvantage. Breeding work to produce a form with one-seeded seed balls has therefore been initiated. Certain plants of this type were found; the F₁ from free pollination of these plants were all many-seeded but in the F₂ there appeared a number of plants with delayed flowering and these all proved to be one-seeded. They were luxuriant in growth, with a large number of stems and leaves; some were as much as two months later in flowering, though others were only 10-15 days later and occasional plants no later at all; certain plants failed to flower. These one-seeded plants occurred in the F₂, in the proportion of 25 per cent or slightly less.
 Another type of one-seeded plants also occurred, characterized by very small and densely arranged seed balls and delay in flowering of about one month. The two types appear to be genetically distinct.
364. TOLMAN, B. 633.63-1.421
Designing variety tests to reveal the adaptability of varieties to varying levels of fertility, spacing and differences in rate of maturity.
 Proc. Amer. Soc. Sug. Beet Tech. 1938 : p. 51. (Mimeo graphed).
 A test is mentioned in which 24 varieties were included, with 10 to 12 replications; and two fertility levels, two spacing and two harvest dates were considered. It is believed that the information on adaptation obtained from tests of this sort is of great importance for breeding work and distribution of varieties.
365. DAHLBERG, H. W. 633.63-1.524(4 + 73)
 633.41-1.524(4 + 73)
Some observations on wild beets (*Beta maritima*).
 Proc. Amer. Soc. Sug. Beet Tech. 1938 : 76-79. (Mimeo graphed).
 Some observations by the author on the Mediterranean and North Sea types are given together with quotations from Munerati on the Mediterranean type and from Tjebbes on the North Sea type. The Mediterranean wild forms of *B. maritima* tend to be annual, the North Sea forms biennial. Some analyses of North Sea types grown in the western U.S.A. and of hybrids between them and cultivated sugar beets are given.
366. SCHIETERS.
 (Bolters). 633.63-1.547.4:575
 Van Zaad tot Suiker 1936 : No. 1 : 8-13.
 In this composite paper containing the views of Dudok van Heel and R. W. Janssen, the difficulty of determining the environmental factors conditioning the expression of the hereditary tendency to bolting in sugar beets is made clear.
 Strains differ in their reaction to environment and bolting is conditioned by numerous factors. Selection so far has been eliminating strains bearing factors that determine bolting under ordinary conditions in Holland and must now be directed to the elimination of types with a genotype that determines bolting under abnormal conditions such as those of the year 1936.

367. ROEMER, Th. 633.63-1.557-1.531:575
Aussaatzeitenversuch 1927-1936 mit 3 Zuchtrichtungen. (**Time of sowing experiments 1927-1936 with 3 types of strains**).
Zuckerrübenbau 1937 : 3 : Pp. 4.

A comparison of three strains of sugar beet, E, Z and ZZ sown at three different periods showed that the later the time of sowing the more the yield, sugar yield and leaf yield decreased. Varietal differences were very considerable. The E strain was markedly superior to the others.

368. COONS, G. H. et al 633.63-2.484-1.521.6:575
Tests of U.S. 217 in 1937. 633.63 U.S. 217
Proc. Amer. Soc. Sug. Beet Tech. 1938 : 85-87. (Mimeographed).

U.S. 217 is composed of five inbred strains of sugar beet resistant to *Cercospora* leaf-spot allowed to intercross.

The results of 11 tests conducted in 1937, here presented, allow of the guarded conclusion that the variety performed satisfactorily where tried, except in Minnesota, where yields were low. The leaf-spot resistance of the variety was conclusively demonstrated.

369. HAFEKOST, G. 633.63-2.484-1.521.6:575
Die Züchtung krankheitswiderstandsfähiger Zuckerrübensorarten. (**The breeding of disease resistant varieties of sugar beet**). 633.63-2.8-1.521.6:575
Wien. landw. Ztg. 1938 : 88 : 74-75.

An account of the breeding by American workers of strains of sugar beet resistant to *Cercospora beticola* and curly top (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 256).

370. OWEN, F. V., THORNE, G. and MCBETH, C. W. 633.63-2.6-1.521.6:575.42
Varietal tests for resistance to sugar beet nematodes.
Proc. Amer. Soc. Sug. Beet Tech. 1938 : p. 71. (Abst.) (Mimeographed).

Attempts have been made during the past ten years to select nematode-resistant sugar beets, but efforts to compare the selections with standard varieties were hindered by the incidence of curly-top. In 1935 selections for nematode resistance were made from U.S. No. 1 and U.S. No. 34, which are known to possess resistance to curly-top. The U.S. No. 1 selection was compared in 1937 with 14 other curly-top resistant strains. No marked resistance to nematodes was found either in the selection or in the other varieties.

371. CARSNER, E. 633.63-2.8-1.521.6
The present status of curly-top resistance in sugar beets.
Phytopathology 1938 : 28 : p. 669. (Abst.).

The characteristics of the new varieties U.S. 12, U.S. 33 and U.S. 14 are briefly described. U.S. 12 is highly resistant to curly top and U.S. 33 and U.S. 14 are moderately resistant. U.S. 14 is susceptible to downy mildew and U.S. 33 to bolting.

372. OWEN, F. V. et al. 633.63-2.8-1.521.6:575(73)
Curly top resistant varieties.
Proc. Amer. Soc. Sug. Beet Tech. 1938 : 91-94. (Mimeographed).

The characteristics of five new strains of sugar beet resistant to curly-top are briefly described and the results are given of variety tests in which they were compared with the existing resistant varieties U.S. 12 and U.S. 33 under conditions of severe and medium curly top exposure, and of other tests. After another year's testing in different localities it is hoped that the strains to be released will be chosen.

373. ABEGG, F. A. 633.63-2.8-1.521.6:575.116.1.061.6
The inheritance of curly-top resistance in beets.
 Proc. Amer. Soc. Sug. Beet Tech. 1938 : p. 72. (Abst.) (Mimeographed).
 Resistance to curly-top is believed to be conditioned by a partially dominant factor C linked with the crown colour factor R.

374. BOITEAU, P. 633.682:576.312.35
Cytologie du manioc. (Cytology of manioc).
 Chronica Botanica 1938 : 4 : 386-87.

The author reports the chromosome number $2n = 4$ in root tips of manioc (*Manihot utilissima*). Twenty varieties were studied, and all found to be diploid. The chromosomes are small, 1.5μ and 3.5μ long respectively. Their small number and certain features of their mitosis suggest that manioc is one of the most primitive dicotyledons.

One variety of *M. palmata* and one of *M. Glaziovii* studied, each had the same chromosome number, $2n = 4$, but the chromosomes were larger than in *M. utilissima*. Hybridization of these two species gave only parthenocarpic fruits or shrunken, sterile seeds. It appears that they are not compatible.

375. JENSEN, H. W. 633.685:576.312.332
Meiosis in several species of dioecious monocotyledoneae I. The possibility of sex-chromosomes.
 Cytologia, Tokyo 1937 : Fujii Jubilee Vol. : 96-103.

The author considers that in male *Dioscorea quaternata*, the chromosomes are arranged in a continuous spireme in prophase, and comes to the conclusion that the chromosomes therefore have no individuality, in spite of the fact that "the spireme . . . later becomes segmented into the haploid number of chromosomes!"

At meiosis he observes the extrusion of a large "chromosome" into the cytoplasm in about a third of the cells. This may or may not split up into fragments of smaller size, but in any case it finally disintegrates entirely. The possibility that this "chromosome" may be a persistent nucleolus is not discussed. The author concludes that this does not represent a sex-determining mechanism, and suggests that there cannot be such a mechanism, since the chromosomes have no individuality.

The author also fails to find any undisputed sex-determining mechanism in male *Smilax rotundifolia* and *S. glauca*.

STIMULANTS 633.7

376. ARGIRESCU, V. 633.71:575(49.8)
Tutunul Molovata. (The tobacco Molovata).
 Bul. Cultiv. Ferment. Tutun. 1938 : 27 : 215-28.

An account of the variety Molovata obtained by selection from local varieties 1916-1918, its botanical characters, methods of cultivation and yield.

377. BOLSUNOV, I. 633.71 *N. rustica* : 575 "793"
(Inheritance of the length of the vegetative period in the first hybrid generation of different races of *Nicotiana rustica*).
 Bull. Inst. Genet. U.S.S.R. 1937 : No. 11 : 49-58.

Earlier maturing forms are much desired for the more northerly areas of cultivation of *N. rustica*. Crossings were made involving 74 combinations of parents differing in time of maturity; earliness was dominant in 23 of these, partially dominant in another 22, intermediate in 21 and in 5 crossings late maturity proved dominant; finally, 3 crossings showed transgression, the hybrid being either earlier or later than either parent. It seems clear that several genes are operative, some dominant, some recessive.

In crossings involving certain varieties earliness was seen to be nearly always dominant, whilst in those of certain others it was rarely or never dominant. Vigorous vegetative development was sometimes associated with a delayed flowering, but by no means invariably. Conditions of development did, however, influence the dominance relations, earliness in a given hybrid being dominant under certain growth conditions, intermediate under others and recessive under still others. No difference was observed in reciprocal hybrids.

378. DUMITRESCU, C. 633.71:575.125
 Contribuționi la ameliorarea varietății de tutun Banat prin metoda heterosis. (**Contributions to the improvement of the tobacco variety Banat by means of heterosis.**)

Bul. Cultiv. Ferment. Tutun. 1938 : 27 : 236-47.

The necessity for the improvement of Rumanian tobacco is pointed out, the results of hybridization obtained by other workers are discussed and a brief account is given of the technique used. Crosses were made between the varieties Banat ♀ x Ghimpăti ♂, Ghimpăti x Molovata, Banat x Molovata and Molovata x Banat.

The progeny of the last two crosses were destroyed by hail and only the results of the cross Banat x Ghimpăti and the reciprocal are described. The reciprocal F₁ plants were identical. The hybrid vigour of the F₁ plants was very marked. The hybrids were intermediate in most morphological characters but some of the characters of Banat were dominant.

379. KOSTOFF, D. and ARUTIUNOVA, N. S. 633.71:575.127.2:575.125:576.31
The size of the cells in the F₁ hybrids and their parents in relation to the size of the hybrids. A contribution to the problem of "heterosis".

Arch. Bot. 1935 : 11 : 264-74.

Interspecific tobacco hybrids were of five types: (1) those showing hybrid vigour in whatever conditions or locality they were grown, (2) those showing dwarfing invariably, (3) those intermediate, (4) those that varied in size, according to the conditions under which they were grown, between dwarf and intermediate and (5) those that varied between intermediate and vigorous. Data are presented showing the size of cells in these different types. In the dwarf hybrid *N. paniculata* x *N. Langsdorffii* the cells of the root tips were smaller than in both parents; in the vigorous hybrid *N. Tabacum* x *N. sylvestris* the cells were no larger than either parent, and in all other hybrids they were intermediate. Cell size in the dwarf hybrid *N. paniculata* x *N. Langsdorffii* was also smaller in the palisade parenchyma, whilst in another dwarf, *N. Tabacum* x *N. Sanderae*, these cells were larger; and the vigorous hybrid *N. Tabacum* x *N. sylvestris* had palisade cells slightly below the parents in size. In *N. suaveolens* x *N. longiflora* the cells were larger than the parents and in the remaining three hybrids smaller. The stomatal cells were also no larger than the parents in the vigorous hybrids. They were somewhat larger in *N. longiflora* x *N. Sanderae* and *N. paniculata* x *N. Sanderae*. The dwarf hybrid *N. Tabacum* x *N. paniculata* and its reciprocal had stomatal cells larger than both parents, the other dwarfs *N. Tabacum* x *N. glutinosa*, *N. triplex* x *N. glutinosa* and *N. paniculata* x *N. Langsdorffii* smaller.

N. triplex (segregates from the hybrid *N. Tabacum* x [*N. sylvestris* x *N. Rusbyi*]) resembled *N. Tabacum*, again supporting the view that this species arose by hybridization from *N. sylvestris* and *N. Rusbyi*.

380. TERNOVSKIJ, M. F. 633.71:575.127.2:576.356.5
Amphidiploid shoots of the F₁ hybrid Nicotiana Tabacum L. x N. sylvestris Speg. et Comes.

C.R. (Doklady) Acad. Sci. U.R.S.S. 1937 : 15 : 151-52.

One fertile plant was found among a large number of sterile plants in the F₁ of the cross in question. Later, two sterile shoots appeared on the plant. A cytological examination

showed that the roots and sterile shoots had 36 chromosomes, the fertile shoot 72. Meiosis was not perfectly regular—pollen germination was poor and the pollen tubes grew slowly, which resulted in low fertility. It is suggested that the polyploid shoot arose as the result of treatment during pollination of the original cross.

381. SCHMUCK, A. A. 633.71:575.127.2:581.192.6
 (The chemical composition of alkaloids of interspecies hybrids of the genus *Nicotiana*).
Bull. Acad. Sci. U.R.S.S., Sér. Biol., 1937 : 1693–708.

Although the quantity of alkaloid present varies very widely in different varieties and plants of *N. Tabacum*, yet no alkaloid other than nicotine has ever been detected. *N. glauca* contains anabasin and no nicotine and other species contain different alkaloids still, e.g. nornicotine in *N. sylvestris*, together with a certain amount of nicotine. The hybrid *N. sylvestris* x *N. Tabacum* contained nornicotine alone and nicotine was entirely absent; no new alkaloid, unknown in the parental species, was detected. In subsequent generations which have been investigated up to F_5 , there occurred plants with only nicotine, plants with only nornicotine and plants with mixtures, of the two in various proportions: again no new alkaloid was detected.

N. Rusbyi also contains nornicotine but no nicotine. F_1 hybrids *N. Rusbyi* x *N. sylvestris*, however, contain appreciable quantities of nicotine; this is not, however, a new alkaloid, since *N. sylvestris* is known to contain it in small amounts.

In *N. Tabacum* x *N. glauca* hybrids nicotine was also absent, anabasin being present in larger quantities than in the *N. glauca* parent. Later generations contained plants with nicotine, plants with anabasin and plants with both, the anabasin in such cases being usually predominant. Hybrids *N. rustica* x *N. glauca* x *N. Tabacum* also contained either anabasin or that and nicotine.

Crosses involving *N. Langsdorffii* and *N. alata*, both containing nicotine though in different proportions, contained either nicotine or nornicotine, an alkaloid present in small quantities in *N. Langsdorffii*, or both. Thus although by interspecific crossings it has not apparently been possible to produce forms with a totally new compound not present in the parents, yet the proportions of existing alkaloids may be very radically changed.

382. LUBIMENKO, V. N. 633.71:575.127.2:575.061.6
 SZEGLOVA, O. A. and 633.71:575.127.2:581.192.6
 GORTIKOVA, N. N.
 (The physiological bases of inheritance of plastid pigment. The quantity of chlorophyll, xanthophyll, carotin and nicotine in interspecific hybrids of the genus *Nicotiana*).
Bull. Inst. Sci. Lesshaft 1937 : 20 : No. 2 : 3–36.

The mean, maximum and minimum content of green and yellow pigments was measured in a number of species of *Nicotiana* and found to vary greatly from species to species. The proportion of yellow to green pigments was also different in different species and varied in different forms within the species. The proportion of xanthophyll to chlorophyll is fairly constant, the proportion of carotin becomes greater as the total amount of pigment increases.

The mean content of all pigments was higher in most interspecific hybrids than in either of the respective parents. As regards their proportion, certain hybrids appeared in which there was a very much lower proportion of carotin than in either of the parental species and others in which the proportion was much higher. Thus as regards the quantity of chlorophylls the following types of hybrids appeared, (1) the maternal type was fully dominant, (2) the paternal type was fully dominant, (3) the hybrid exceeded both parents, (4) the hybrid was less than both parents and (5) the hybrid was intermediate between parents. An increase over the parents was observed in six of the crossings studied and a decrease in two; maternal dominance was observed in five cases, the maternal parent being the higher in three crossings, namely *N. longiflora* x *N. Sanderae*, *N. sylvestris* x *N. Tabacum macrophylla* and (*N. Tabacum* x

N. tomentosa) x *N. Rusbyi* and the lower in *N. glutinosa* x *N. sylvestris* and *N. Rupa* and *N. paniculata*. Only in one cross was the paternal parent, which was in this case the lower of the two, dominant. In three other crossings the hybrids were intermediate. The alteration of the proportion of chlorophylls and carotenoids on hybridization is ascribed to differences in the combinations of the enzymes taking part in the synthesis of chlorophyll. The different chemical aspects of this synthesis are discussed.

Nicotine content was not in any way correlated with chlorophyll content. In eight of the hybrids the nicotine was less than in the parents, in three greater and in four intermediate. Only in two crossings was the nicotine content of either parent actually dominant.

383. PRAKKEN, R. 633.71:575.25
Zwei verschiedene Fälle somatischer Spaltung in der Blutenepidermis heterozygoter Pflanzen. (Two different cases of somatic segregation in the flower epidermis of heterozygous plants). 635.652:575.25
Genetica 1938 : 20 : 453-57.
- In the F₁ hybrid of *Nicotiana atropurpurea* (dark red flowers) and *N. Tabacum* (Amersfoort Rasse, pink flowers) dark red was dominant but in one plant a branch occurred producing pink flowers. Selfed, this branch gave 3 red : 1 pink as did the branches bearing red flowers and while stem cuttings from it gave pink flowers, root cuttings from the plants so established gave only red flowers. The phenomenon might be due to loss of a whole chromosome or part of one, somatic crossing-over or gene mutation but, whatever the change was, it affected only the epidermal layer.
- In *Phaseolus vulgaris* flowers of the constitution *Vv_{lae}* are somewhat lighter purple than *VV* flowers. A *Vv_{lae}* flower was found with two adjacent parallel streaks, one purple (*VV*) the other lilac (*v_{lae} v_{lae}*). This is due either to somatic crossing-over or to some aberration involving whole chromosomes and producing two correlatively altered cells.
384. AKKÖYUNLU, Z. 633.71:575.42(49.6)
Tütün islah isi programınıza umumî bir bakış. (A brief account of the programme of tobacco selection).
Inhisarlar Tütün Enstitüsü Raporları. 1937 : 1 : 15-22.
A review of the organization of tobacco selection in Turkey giving the aims and methods of research.
385. GOODSPEED, T. H. 633.71:576.356:537.5
Significance of cytogenetic alterations induced by high frequency radiation in *Nicotiana* species.
Cytologia, Tokyo 1937 : Fujii Jubilee Vol. : 961-66.
An account of the types of structural chromosomal change produced by X-rays in *Nicotiana*, with a description of their genetical effect in subsequent generations.
The possible evolutionary significance of such structural changes is discussed.
386. HOLMES, F. O. 633.71-2.8-1.521.6:575.127.2
Inheritance of resistance to tobacco-mosaic disease in tobacco.
Phytopathology 1938 : 28 : 553-61.

A fuller account of the work reviewed in "Plant Breeding Abstracts", Vol. VIII, Abst. 915. It is mentioned that in the back-crosses with the variety Connecticut Broadleaf, aberrant ratios occurred and no homozygous necrotic lines were established. Burley and Samsoun varieties gave 1 : 1 back-cross ratios and 3 : 1 ratios on selfing heterozygous necrotic types and from the Samsoun back-crosses a homozygous necrotic line has been established.

387. TERNOVSKY, M. F. 633.71-2.8-1.521.6:575.127.2
(Inheritance of mosaic localization in *Nicotiana glutinosa* L. x *N. Tabacum* hybrids).
 Vsesojuznyi Naučno-Issledovatel'skii Institut Tabačnoi i Makhoročnoi Promyšlennosti imeni A.I. Mikojana. (All-Union Mikojan Research Institute of the Tobacco and Makhorka Industry). Krasnodar 1938 : No. 135 : 71-74.
 The dominance of the gene, found in *N. glutinosa*, for the necrotic type of reaction to mosaic (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 1317) is maintained in the amphidiploids and the sesquidiploids from *N. glutinosa* x *N. Tabacum*.
 Repeated back-crossing of the sesquidiploid bearing the two *Tabacum* genomes resulted in non-Mendelian segregation due probably to gametic and zygotic eliminations as a consequence of meiotic irregularities.
 At the end of the second year thirty-three families constant for immunity, bearing the gene determining localization of infections and closely resembling the *Tabacum* parent, Dubec 44 39, had been obtained in the fourth and fifth generation. The somatic chromosome number attributed to these constant lines is 48. Further cytological investigations are planned.
388. TERNOVSKY, M. F. and KHUDYNA, J. P. 633.71-2.8-1.521.6:575.127.2
(Response of *Nicotiana glutinosa* x *N. Tabacum* hybrids to ordinary tobacco mosaic).
 Vsesojuznyi Naučno-Issledovatel'skii Institut Tabačnoi i Makhoročnoi Promyšlennosti imeni A.I. Mikojana. (All-Union Mikojan Research Institute of the Tobacco and Makhorka Industry). Krasnodar 1938 : No. 135 : 69-70.
 The sesquidiploids obtained from the amphidiploid of *N. glutinosa* x *Tabacum* back-crossed to either parent react to mosaic by localized necrotic lesions instead of systemic infection. In the second generation from the sesquidiploid with two *Tabacum* genes, segregation for morphological characters, chromosome number and mosaic resistance occurred. Most plants showed systemic infection, but some only developed necrotic lesions at the site of infection. In the third generation 10 families out of 19 studied proved resistant and in one family 50 per cent of the plants gave the localized reaction.
 It seems possible that the progeny of the sesquidiploid with two genomes from *Tabacum* have a relatively longer incubation period for the disease.
389. BUNDSCUH, R. 633.71.00.14:581.142:581.48
 Vergleichende Morphologie und Physiologie von Tabaksamen verschiedener Sorten. (**Comparative morphology and physiology of tobacco seeds of various varieties**).
Landw. Jb. 1938 : **86** : 280-330.
 An attempt to differentiate between the seeds of eight varieties of *Nicotiana Tabacum* and two varieties of *N. rustica* by morphological and physiological methods, showed that the only promising line of approach is by modifications of the "Wurzelbild" method of E. W. Schmidt, by which the development of the young roots is studied. Further work is needed before any definite conclusions are reached.
390. WELLENSIEK, S. J. 633.72:581.162.3
 Bloembiologie en kruisingstechniek bij thee. (**Floral biology and technique of crossing with tea**).
Arch. Theecult. Ned.-Ind. 1938 : **12** : 127-40.
 Observations on the biology of flowering and the technique of artificial pollination are recorded, with data on the results of a crossing experiment and on the frequency of self-pollination in a test with 40 trees under conditions in Java.
 Out of 400 crosses the set was 12·3 per cent, estimated by the amount of viable seed. Selfing apparently occurs much less often than cross-pollination though definite figures indicating its extent are not yet available.
 In practice, protection from insect pollination is superfluous.

391.

WELLENSIEK, S. J.

Waarnemingen aan oculaties op jonge theeheesters. (**Observations with buddings on young tea bushes**).

Arch. Theecult. Ned.-Ind. 1938 : 12 : 107-26.

Yield data are presented (1) from 43 mother tree clones bud-grafted on to young tea bushes each of a known yielding capacity; (2) from some of these latter self-budded; and (3) from some left unbudded.

The output of the mother tree clones in general, rose during the period of production as compared with groups (2) and (3) above; and this increase was greater for clones with higher yields. The 5 best clones yielded for the whole production period 31-48 per cent more than the unbudded group, and 63-83 per cent more than the self-budded group. Those 5 clones are to be tested further, though more clones to be obtained by more rigid selection of mother trees should give still better yields.

No correlation was discovered between yield from mother trees and the average yields from the corresponding clones—a finding not surprising in view of the small range of variation between the mother trees in this instance. Another mode of comparison, however, indicated that such a correlation did probably exist.

The potential yield of the buddings was markedly influenced by the stock, but the influence of the clone was greater still.

In testing clone yields, comparisons should be made with yields from both self-budded plants and unbudded plants.

392.

ABEELE, M. van den

633.73:575(92.2)

Quelques données sur la sélection du café dans la "Proefstation Midden- en Oost-Java". (**Some data on the selections of coffee in the "Proefstation Midden- en Oost-Java"**).

Bull. Agric. Congo Belge 1938 : 29 : 136-40.

Notes on the methods of coffee selection and cultivation as practised in Java.

393.

HEYN, A. N. J.

633.73:576.312.35

633.513:576.312.35

633.18:576.312.35

632.951.1:576.312.35

633.917:576.312.35

Du nombre de chromosomes chez quelques végétaux en culture aus Indes Néerlendaises. (*Coffea, Ceiba, Oryza, Derris et Palaquium*). [**On the number of chromosomes in certain plants cultivated in the Dutch East Indies (*Coffea, Ceiba, Oryza, Derris and Palaquium*)**].

Ann. Jard. Bot. Buitenz. 1938 : 48 : 103-20.

This is the original paper of which an abstract has already been reviewed in "Plant Breeding Abstracts", Vol. VIII, Abst. 1114.

394.

STOFFELS, E.

633.73-2.19-1.521.6:575.11

633.73:575.42

Résultats d'observations sur les populations et lignées d'Arabica au Kivu. (**Results of observations on the poulations and lines of Arabica and Kivu**).

Ann. Gembl. 1938 : 44 : 246-49.

The author corrects some erroneous impressions which arose during a discussion of his paper (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 1285) and further discusses the subject of the influence of the female parent.

395.

- COOLHAAS, C.
Het Proefstation Midden- en Oost-Java. (**The Central and East Java Experiment Station**).
Bergcultures 1938 : 12 : 582-84.

A general discourse made on the occasion of a ceremonial visit to the Station and touching on organization and work of the Divisions dealing with the cultivation and improvement of coffee, rubber, cacao, diseases and pests, technological research including work on the quality of coffee and cacao, and comparative trials of plants, soils, etc.

396. OSTENDORF, F. W. 633.74:581.162.3:581.48:575.061.6
Spontane kruisbestuiving en selectie op zaadlobkleur bij cacao. (**Natural cross-pollination and breeding for cotyledon colour in cacao**).
Bergcultures 1938 : 12 : 552-58.

The mode of inheritance of the recessive character, white cotyledons (p and its allelomorph P) and the ratios that may occur in various crosses and back-crosses are explained with their genetic implications, already familiar to plant breeders. The question of cross-pollination is considered with frequent reference to the findings of Pound and Voelcker and possible variations in the genetic ratio caused by this factor are exemplified. Though obligate cross-pollination is compatible with high yield it may limit productivity in so far as suitable pollinators are or are not available. The author holds that in Javanese plantations the amount of natural crossing must be considerable. He also estimates that in a self-sterile tree 5-10 per cent of the flowers would be pollinated, i.e. by natural crossing.

The way in which cross-pollination is effected is unknown; the possibility of anemophily as a factor is tentatively suggested.

Since Djatiroenggo clones are being used by planters and may comprise sterile forms, monoclonal plantations are inadvisable until further data are obtained. Incidentally it is stated that clones DR 18, 34 and 42 are probably pp in genetic constitution and none of the DR clones are PP . From observations the author concludes that it is impossible to infer the existence of a correlation between superior vigour and purple cotyledons and in investigating the problem it must be remembered that in some cases plants arising by cross-pollination are more vigorous than those from self-pollination. Data from inbred Assinan-angoleta seedlings (MJ 331 B) taken from a plantation which showed little variation in cotyledon colour and other genetic characters and in which therefore little variation in the growth vigour of self and cross-pollinated plants would be expected, revealed no difference as regards rapidity of growth in "white" and "purple" individuals. Further research is however needed on this problem.

397. OSTENDORF, F. W. and 633.74:581.6:578.081
ROELOFSEN, P. A.
Selectie van cacao op kwaliteit. (**Breeding cacao for quality**).
Bergcultures 1938 : 12 : 440-46.

The difficulties (1) of estimating those components of quality in cacao, such as aroma, which can only be determined from the fermented product, and (2) of obtaining from small samples from experimental plant material adequate information about the likely quality of the marketable product ultimately produced in bulk are discussed. To meet this latter difficulty, however, a method of sampling was evolved by Knaus (1935) and improved by Roelofsen (1936) which has now been used in testing the quality of the marketable product from a number of mother trees and clones; and the results for Djatiroenggo clones, of which tested selections (buddings and seed) are being introduced into commerce are examined. Among the standards used were the number of pods, weight of cocoa per pod, bean weight and percentage of wrinkled beans.

In yield of marketable cocoa per pod, clone DR1 was outstanding, DR2, 38 and 41 were good, but DR 36 was relatively poor. DR1 was also best as regards the colour of the break, with DR 38 a good second. The product from these clones was very variable in quality in spite

of the fact that all except DR7 had been regarded as the best of the DR series and that the mother trees of six of the clones had been selected for quality.

From some comparative data on the estimates formed of the quality of the mother trees (1912) and the corresponding clones (1928) and their performance as above described, it is clear that the quality of the marketable product is by no means based solely on the percentage of light coloured cotyledons. For a final estimate of these clones, however, productivity and disease and pest resistance, etc., would also have to be considered.

Similar data for clones of the Assinan-angoleta type allowed of a provisional conclusion that they are relatively uniform as compared with the DR clones.

The mother trees of the Getas-forastero types obtained by selection were tested for the quality of the cocoa and found to be quite unsuitable types for commercial planting.

AROMATIC PLANTS 633.8

398.

633.8:668.5:575.127
633:581.192

NILOW, W. J.

(**Laws in the chemical variability of plants**).

Bull Acad. Sci. U.R.S.S., Sér. Biol. 1937 : 1709-32.

Varietal differences in oil content from 0·5 to 11·3 per cent have been observed in lavender and the linalyl acetate content varies from 11 to 87 per cent of the oil. Similar variations have been observed in rosemary, fennel, caraway and other aromatic plants. The sugar content of peaches varies from 5·4 to 15·26 per cent, the oil content in peach kernels from 5-60 per cent. There are great possibilities for selection in such plants, therefore, especially those that can be vegetatively reproduced, such as *Coluria geoides*, where the eugenol content has been raised from 1 per cent. to 1·9 per cent by selection in a single generation.

Inheritance studies showed that a certain plant of *Pelargonium radula* segregated very widely on selfing, suggesting that it was an interspecific hybrid. Moreover, analysis showed some of its segregates to contain decyclic acid, which was not present in the parent form and has not hitherto been known in the species, nor in *P. capitatum*. Similarly segregates from hybrids of *Ocimum canum* (containing camphor) and *O. gratissimum* (containing eugenol) have been found to contain citral, no trace of which has been found in either of the parents. Another cross of *Ocimum* No. 49 x *O. canum*, the former of which contains linalool, the latter camphor, gave a hybrid containing a camphor derivative, borneol.

The importance of these new compounds occurring in interspecific hybrids, the author considers, lies in the proof they furnish that by this means the enzymatic tendency of the plant may be altered, since the new components constitute related compounds but represent different end products of the reaction producing them.

Crosses so far carried out indicate that the compound that is chemically the more complex tends to be dominant; thus the F₁ of *O. canum* (camphor) x *O. gratissimum* (eugenol) contained eugenol, the F₁ of *O. pilosum* (citral) x *O. canum* (camphor) contained camphor. In crosses where the two components are not readily chemically converted one into the other the F₁ often contains both, e.g. *P. radula* (menthone) x *P. capitatum* (citronellic acid).

399.

633.812:575:581.162
633.956:575:581.162

NESTERENKO, P. A.

[**Biology of aromatic plants. Rosemary (*Rosmarinus officinalis*). Camphor basil (*Ocimum canum* Sims.)**].

Trudy Gosudarstvennogo Nikitskogo Botaničeskogo Sada (Trans. Nikita Bot. Gdn., All-Union Inst. Pl. Ind., Crimean Exp. Sta.) 1935 : 18 : Part I : Pp. 124.

The first part of this pamphlet deals with *R. officinalis* and comprises information on its origin, utilization in various countries, area of distribution, main botanical features, the biology of flowering, pollination and emasculation, and the development of the flower, in addition to information on breeding.

Experimental results support the view that rosemary is almost exclusively cross-pollinated and though selfing is possible it is unlikely to occur extensively under natural conditions.

Some strains give a better set on selfing than others. Crosses recorded at the Nikita Botanical Garden suggest that many of the populations studied there had arisen from hybridization between different races. Reciprocal crosses do not always behave in the same way as regards the set and a genetic and cytological study of the plant is called for. Some brief notes on abnormalities observed in pollen mother cell development are mentioned in the present paper. Inbreeding should not always be used in practical breeding, since certain forms on selfing tend to produce seeds that are empty or do not germinate.

The wide variation (from 0-90 per cent) in the amount of good seed borne by the various hybrid forms of *R. officinalis* in the U.S.S.R. is attributed to different degrees of relationship between the parents of the various hybrids. The wild forms of rosemary are probably maintained by the multiplication of fertile forms or by hybridization among forms of varying degrees of fertility or even by mutation due to injury in the process of harvesting or to other causes.

The collection of high-yielding forms and the development of breeding work, which should together ultimately lead to the production of economically valuable varieties, cannot be rapidly accomplished and propagation of the best material in existing populations by cuttings should be adopted as a temporary means towards improving the present plantations in the U.S.S.R.

Attempts to correlate the yield of oil with morphological characters can scarcely give promising results, though investigations with cuttings of different forms of rosemary would appear at least to show that types with light purple, blue or white corollas and dark green, greyish leaves, markedly curled at the margins, give the best yield of oil (i.e. from 1·5-3·4 per cent from the dry leaf). This correlation was confirmed by experimental results showing that white or light purple flowers and the above mentioned leaf characters were accompanied by a relatively high number of oil glands on the calyx and other organs. As the data from which the correlation is postulated are admittedly inadequate, further investigations on the point should be made. In describing the various types of secretory glands found in rosemary, their importance in breeding is stressed.

Forms with the dark green or greyish green, narrow leaves with curled margins, usually in conjunction with light purple or white corollas, show a relatively higher frost resistance combined with vigorous growth and abundant flowers.

The physical and chemical properties of the oil are discussed with reference to the place of origin and the developmental and seasonal changes of the plants. The possibility of the variations observed being specific and hereditary is also considered. At present it is impossible to generalize from the contradictory results obtained, but improved methods for future experimentation are suggested, including vegetative propagation of desirable types and the use of biochemical data to aid the breeder in the systematic classification of the different varieties and also in meeting commercial requirements.

The cultivation of rosemary and its distribution in the U.S.S.R., vegetative propagation, harvesting and the manufacture and chemical composition of the oil are reviewed, with a table showing the relevant chemical data for rosemary from different countries of origin.

The second section of the pamphlet contains information on the area of distribution and the types of *O. canum* Sims., on its history (including the discrepancies in the various views held as to its camphor content), and on the anatomical and morphological characteristics of various species (including the types of glandular hairs and their location, function and number). In addition the following questions are discussed: the biology of growth and flowering, pollination, bagging, emasculation, pollen viability, the yield of seed and seed storage, vegetative reproduction, the root system, cultural and climatic requirements of the plant, yield and the leaf and inflorescence as the main sites of camphor elaboration, and the period of maximum storage of camphor.

A fairly high percentage of hybrids was obtained from the cross *O. canum* x *O. gratissimum* but the reciprocal was the more successful. The F₁ was intermediate in colour, i.e. pink, the corolla of *O. gratissimum* being red and of *O. canum* white; but all in the early stages resembled *O. canum* in habit and other morphological characteristics. From the chemical standpoint the first generation resembled *O. gratissimum*, for though the young plants and even young leaves on full grown plants smelt of camphor, by the time flowering was ending the

predominant aroma was that of eugenol, which is characteristic of *O. gratissimum*. The F₁ plants also differed from *O. canum* in being larger and having darker leaves. The yield of oil from the hybrids was 0·3–0·4 per cent, from *O. canum* 0·6 per cent and from *O. gratissimum* 0·2 per cent, while the corresponding figures for the numbers of secretory glands on the under-side of the leaf were 5–6, 9 and 3–4 per cent. Pollen formation in the hybrids was normal though the germination capacity was somewhat reduced, i.e. 8 per cent as compared with 41 per cent in *O. canum* and 26 per cent in *O. gratissimum*. The whole F₁ showed decreased fertility, some plants being entirely sterile, though in a considerable number the degree of self-fertility was represented by a set of 20–25 per cent and in some hybrids even over 50 per cent set was obtained.

From 1420 seeds sown in the F₂ 23 plants were obtained. The F₂ comprised individuals scented like the hybrids and others resembling the parent species. An amphidiploid was also found in this generation and resembled the F₁ as regards odour. Back-crosses of the hybrids to the parent forms gave seed which did not, however, germinate.

A brief bibliography of French, German, Italian and Russian works consulted on rosemary and camphor basil ends the pamphlet.

400. HEIMANS, J. 633.822:576.312.35:582

Chromosomes in the genus *Mentha*.

Chronica Botanica 1938 : 4 : 389–90.

On taxonomic grounds, it has been considered that *Mentha nemorosa* is a hybrid between *M. rotundifolia* and *M. longifolia*. Because of its fertility and true-breeding nature, the author considered it likely that it was an allotetraploid of these two species as parents. Cytological evidence is now forthcoming to confirm this. *M. longifolia* and *M. rotundifolia* both have $2n = 18$. *M. nemorosa* is a tetraploid, $2n = 36$.

Another supposed hybrid between *M. longifolia* and *M. rotundifolia*, *M. velutina*, was also tetraploid.

401. SCHERZ, W. 633.835–2.411.4–1.521.6:575

Zur Immunitätszüchtung gegen *Plasmopara viticola*. (**Breeding for immunity to *P. viticola***).

Züchter 1938 : 10 : 299–312.

The aims and methods of vine-breeding at the Müncheberg plant-breeding institute are described. Some of the results of breeding for resistance to *Plasmopara* and the possibilities of combining this with other qualities of economic importance are given.

From the variety Oberlin 595 (*V. riparia* x Gamay) 35,000 F₂ plants resistant to *Plasmopara* are now available. Experiments gave no evidence for the existence of physiological races of the fungus.

The Oberlin 595 F₂ was very variable, practically no two plants were alike but 18·2 per cent of this population was free from the characteristic taste of *V. riparia*. Correlations between taste and habit of growth and leaf-shape were observed.

Back-crossing the European x American hybrids with European varieties showed that some varieties were more suitable than others. As it seems probable that *Vitis vinifera* possesses immunity to *Plasmopara*, the attempt to breed resistant, pure *vinifera* stocks is a work of future importance.

402. OBERMAYER, E. 633.842:575

Der ungarische Gewürzparprika, sein Anbau und seine Züchtung. (**The Hungarian paprika, its cultivation and breeding**).

Ernähr. Pfl. 1938 : 34 : 247–52.

A botanical description of the paprika plant, *Capsicum annuum*, is given together with a detailed account of its cultivation. Breeding, by means of single plant selection, is in progress with the object of selecting a variety with two placentae in the fruit, and one with three. Selection is also needed for a fruit for export, completely free from bitter taste and for a variety free from "capsaicin."

403.

SCHMIDT, M. V.

633.842:575.11:581.162

635.646:575.11:581.162

(A contribution to breeding and seed production in peppers and egg plants).

Gosadarskvennyi Nikitskii Botaničeskii Sad i Krymskaja Zonal'naja Opytnaja Stantsija Ovoščnogo Kh-za (Nikita State Bot Gdn., Crimean Regional Exp. Sta. Veg. Culture) 1935 : Pp. 105.

The first part of this pamphlet deals with pepper—mainly *Capsicum annuum* ($2n = 24$). The historical origin and botanical features of various species and varieties are outlined with notes on the floral biology of the plant, including the phases of flowering, the technique of emasculation and pollination and data on the set obtained with pollen at different stages of development.

The question of the purity of existing varieties in the Nikita Botanical Garden is discussed. The results of previous breeders are tabulated and compared with those obtained at the Southern Littoral centre of the Institute of Plant Industry.

In three crosses (including one with *C. nigrum*) made in 1932 with the same pollen parent, the F_1 fruit shape was intermediate in combinations of plants with blunt-tipped or pointed fruits crossed with plants having round fruits, though other workers record dominance.

Fruit size too was intermediate in the F_1 . In one cross green fruit was dominant to yellow, in another black to green. Watery consistency of the flesh of the fruit was dominant to the compact type of flesh in one cross. Resistance to bacterial disease showed dominance in two crosses. Analysis in 1933 at another breeding centre where a different cross was used revealed a morphologically uniform F_1 in which the thickness of the flesh showed intermediate inheritance, while pointed tips on the fruits were dominant. The F_2 displayed complicated segregation for fruit characters and there was only one individual of the desired type in 5,000 plants.

The possibility of the application of statistical correlations in breeding peppers and egg plants is discussed and a key with descriptions of different varieties concludes the section.

The second part of the pamphlet deals with *Solanum melongena* L. from the standpoints of its origin, nomenclature, botanical characteristics, disease resistance, the development phases of the flower buds, emasculation, time of pollination, the developmental stages of the pollen and its efficiency at various stages, abortion in the female organs, self-pollination and natural hybridization.

Under conditions of free flowering the set is some 25 per cent, which can be increased to 28 per cent by adequate artificial pollination, but with bagging an adequate supply of pollen only results in a 10 per cent set as compared with 6 per cent from natural selfing. To obtain the best results small bags of fabric (of cotton for early varieties with small flowers) should be attached to the petiole of the flower and not covering the whole stem.

In discussing natural crossing, observations of the author and other workers are adduced to show that cross-pollination occurs in the egg plant and that almost all the various strains in the plant collection examined represent populations in which hybrid types are to be found. The highest percentage of cross-pollination obtained by the writer was 2·4 out of 84 emasculated flowers; the pollen is transferred by insects. A distance of two kilometres between varieties is recommended for seed plots of *S. melongena*, unless a special arrangement of the plots is adopted.

Kakizaki's findings on cross-pollination in this plant are cited in some detail.

The genetic findings of Halsted are summarized with some data on the F_1 results obtained in crosses made at Russian breeding centres.

In the cross of the strains Belyjaitsevidnyi and Délicesse the resistance to bacterial disease of the former behaved as a recessive in F_1 and F_2 as well.

In all combinations, including those with Černyi Zmeevidnyi as one parent, the F_1 fruits were intermediate, being long but wider in diameter and more regular in shape than the Černyi Zmeevidnyi type. Earliness was dominant and even transgressive, while fruit size was transmitted as an intermediate character. On the other hand, a tall compact habit (which is undesirable) was dominant to the wide flattened out type of plant.

The bitter tang of the parents was retained in the F_1 fruits to some extent.

Heterosis in various plants is discussed, including Kakizaki's work on *S. melongena* and data on numerous varieties and hybrids at the Nikita Botanical Garden. In the latter investigation earliness was increased by 14 days in the cross of Délicatesse with Bolgarskii and even exceeded the earliest variety Černyi Zmeevidnyi. Combinations comprising the latter variety were extremely early. The yields were low as compared with that of the parents, except in the above mentioned cross in which the yield of the early parent was surpassed. This hybrid also ranked high as regards flavour (for preserving) and gave the highest yield of fruits of commercial value and the lowest of unsound ones.

The diameter of the F_1 fruits was found to increase with the diameter of the fruits of the pollen parent.

The best method tested for obtaining polyploids of *S. melongena*, free from forms with aberrant chromosome numbers, was found to be decapitation accompanied by infection of the wound with *Bacterium tumefaciens*.

A key to the existing varieties of *S. melongena* in the seedling stage and descriptions of a number of varieties are given.

A bibliography of 109 references covering work on peppers and the egg plant is appended.

OIL PLANTS 633.85

404. YERMAKOV, A. J. 633.85:665.3:575
(Individual and intraspecies variability of the oil content of seeds).

Bull. Acad. Sci. U.R.S.S., Sér. Biol. 1937 : 1853-70.

Indications are given of the geographical variation in oil content and the areas in which the forms with the highest oil content occur in respect of linseed, sesame, sunflower and mustard. Hereditary differences between individuals within a sample were observed, the differences being transmitted to the offspring. Crosses between individuals within a sample differing in oil content gave rise to F_1 populations with a range of variation similar to that of the original population.

Segregation for oil content was observed in a single inflorescence of sunflower and great possibilities for improvement are envisaged by means of selection for increased oil and reduced husk percentage, both in this and the other crops mentioned.

405. ZINČENKO, V. E. 633.853.55:575(47)
(Breeding castor oil at the Soviet Research Institute for Oil Crops).
 Seleksija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 6 : 22-24.

A number of varieties improved in oil content, yield and other characters were produced in the early years of breeding by selection, but all suffered from splitting of the capsules. During the last four years non-splitting forms of the *sanguineus* type have been produced, and also an extremely early form suitable for the north; this latter was obtained by hybridization.

406. MOROZOV, V. K. and ANAN'eva, S. V. 633.854.78:575.14
(Results of the application of inbreeding to sunflower at the Saratov Breeding Station).
 Seleksija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 5 : 22-25.

It is pointed out that after 19 years of work no sunflower variety materially superior to the old forms has been produced by inbreeding and the method is regarded as valueless.

407. UKRAINSKII, V. T. 633.854.78-2.5-1.521.6:575
(*Orobanche* on the sunflower and methods of combating it).
 Seleksija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 1 : 36-43.

Among the environmental factors causing variation in the immunity of sunflowers to *Orobanche* are: temperature, pH of the cell sap and the action of various enzymes in the plant; soil

reaction, geographical environment and varietal characteristics of the host. Notes are given on different varieties of sunflower and their reaction to *Orobanche* in regions other than those in which they were bred. All the above factors as well as the problem of the biological races of the parasite and their distribution must be considered in combating the pest and in immunity studies. In the latter type of investigation suitable environment in which to breed resistant plants is needed and ecological conditions must be so chosen that the types bred will retain their resistance on being transferred to other regions.

408. SCHEIBE, A. 633.854.797:575
Zucht- und Anbauerfahrungen mit Saflor (Carthamus tinctorius L.). [Experiences in the breeding and cultivation of safflower (C. tinctorius L.)].

Pflanzenbau 1938 : 15 : 129-59.

An examination of plants from various regions, including India, showed that those from Asiatic countries were quite unsuitable and there was very considerable variation among the plants from European countries. The cause appeared to lie in the reaction of the plants to a disease caused by a *Fusarium*. Though normally cross-pollinated, a certain amount of self-pollination occurs and the behaviour of the different strains varied in this respect. The hectolitre weight was found to be the most suitable criterion for the estimation of the value of the seeds.

Fat content and protein content also vary considerably. Safflower plants with or without prickles are found as well as intermediate forms and the value of these is discussed. The methods of cultivation in Germany are described.

MEDICINAL PLANTS 633.88

409. POSNJAK, A. D. 633.885.1
(Cinchona and its cultivation).

Suppl. 81 Bull. Appl. Bot. Leningrad 1936 : Pp. 172.

A full account is given of the botany and cultivation of cinchona, including sections on the geographical distribution of the species and forms and an outline of the work so far achieved in breeding improved varieties.

RUBBER PLANTS 633.91

410. LODDER, H. 633.912:575.42(92)
Moet men bij de Hevea-selectie andere wegen gaan inslaan? (Must new methods be adopted in Hevea selection?)

Bergcultures 1938 : 12 : 1186-92.

The writer criticises the results so far achieved by the methods of rubber selection in the Dutch Indies with special reference to the economic necessity of rapid improvement in rubber production at a relatively low cost and by extensive as opposed to intensive cultivation. Two defects mentioned in the existing plantations are susceptibility to disease and wound injury due to the bark of the trees being too thin. Such trees moreover require intensive and more costly methods of management.

It is suggested that since by now selection has probably extracted all the valuable characters inherent in the existing material formerly imported from Kew a re-importation of *Hevea* species from Brazil might provide valuable new material for hybridization. In the creation of larger numbers of new clones by crossing desirable types or types with certain outstanding characteristics and differing in their defects, selection must still be applied in eliminating any new undesirable characters in the plantations.

411.

633.912:581.165

Productiecijfers van den *Hevea*-cloon Gondang Tapen I. (**Production figures of the Gondang Tapen I Hevea clone**).

Bergcultures 1938 : 12 : 929-30.

Though the tapping system used was not ideal, the average yield in 1937 was 13 kg. per tree. The Gondang Tapen I clone is also wind resistant and has bast of suitable thickness, shows excellent bast renewal and good closure of the tapping wounds. Among the less desirable features of this clone are susceptibility to brown bast and a defect resulting in coarse ridge formation on the stem; the latter defect could probably be eliminated by selection.

412. HELL, W. F. van and

ZAAIJER, J. W.

633.912:581.165.1

De kenmerken van cloon A.V.R.O.S. 255 op jeugdigen leeftijd. (**The characteristics of clone A.V.R.O.S. 255 in its early years**).

Arch. Rubbervult. Ned.-Ind. 1938 : 22 : 171-77.

The origin, habit and other characteristics of this relatively new clone are described and illustrated, with a tabular enumeration of the botanical features, the latex reaction and the type of bark. The yield has been good and so far no undesirable characteristics have appeared.

413. SCHMÖLE, J. F.

633.912:581.165.1(92)

Verslag tot ult. 1937 van de toetstuinen van cloonen en zaailingfamilies in Polonia. (**Report to end of 1937 on the test plots of clones and seedling-families in the Polonia plantation**).

Arch. Rubbervult. Ned.-Ind. 1938 : 22 : 182-90.

The report previously reviewed (in "Plant Breeding Abstracts", Vol. VIII, Abst. 1298) is here supplemented with tabulated data up to the end of 1937 showing the performance of the rubber trees in the Polonia tests.

The yields from a number of monoclonal plantations of AVROS and other clones are also given separately.

Among the good producers in the two groups only Pilmoor B84, Tjirandji and AV308 were judged satisfactory in addition as regards growth, freedom from breaking of the branches, bark renewal and regeneration of the wound callus. Clone 456 deserves special mention as having given in its seventh year a yield equal to 134 per cent of the yield of clone AV49 and meriting trials on a large scale.

414.

633.912:581.481:578.08

"Heveatweelingen" als plantmateriaal voor de praktijk. (**"Hevea twins" as planting material for practical use**).

Bergcultures 1938 : 12 : 782-84.

Provisional results for a test plot containing numerous pairs of twin rubber plants obtained from a seedling BR2 resulting from uncontrolled pollination show that in their 7th year after planting the two members of the various pairs of plants exhibit no differences as regards height, thickness or yield greater than might be due to the operation of chance. In habit the various pairs are identical. Unfortunately, no observations to compare the growth and production of such seedlings and of ordinary seedlings were taken.

The twin plants were ready for tapping tests in the 5th year. Their stems were round with no flattened side; the roots were normally developed and in the test any damage by wind must be attributed to stem damage.

The splitting of the seedlings did not appear to have affected the output as compared with other plant material. A most important point in the initial operation is to ensure that the tap root is accurately divided into two so that uniform regeneration may ensue in both the resulting partners. This method of multiplication is now being tested by planters on a few estates.

The article concludes with illustrated rules for splitting seedlings to obtain twin plants.

415. SCHWEIZER, J. 633.912-1.541.1:575
Over den wederzijdschen invloed van boven- en onderstam bij Hevea Brasiliensis. (On the mutual influence of scion and stock in H. brasiliensis).
Bergcultures 1938 : 12 : 773-78.
 Mainly a physiological study in which the problems of genetically related scions and stocks and the necessity for selecting stocks suitable as regards growth and flow of latex combined with a good capacity for union with the scion are mentioned. These three characteristics may possibly be independently inherited, but it is probable that forms homozygous for all three will be found.
416. SCHMÖLE, J. F. 633.912-1.541.11:575.12
 633.912:581.165
Hevea brasiliensis en Hevea Spruceana-hybride als onderstam voor oculaties. (H. brasiliensis and H. Spruceana-hybrids as a stock for buddings).
Arch. Rubbert. Ned.-Ind. 1938 : 22 : 178-81.
 The circumference of buddings from the clones AV49, 50 and 256 on stocks obtained from hybrid seedlings of *H. Spruceana* x *H. brasiliensis* was greater than the circumference of buddings of the same clones on *H. brasiliensis* and the difference increased annually in a regular manner.
 Records are given, showing that the yield from the buddings on the hybrid stock, though lower in the first year as compared with the yield from buddings on *H. brasiliensis*, rose in the two succeeding years and in the third year attained 124 per cent of the yield with the latter stock. Moreover the bark renewal was also superior in the buddings on the hybrid stock, the thickness of their bark being 13 per cent greater than when the stock used was *H. brasiliensis*. This investigation should be elaborated with stocks from different crosses with *H. Spruceana*.
417. PODDUBNAJA-ARNOLDI, V. and 633.913:581.162
 DIANOVA, V. 633.913:576.312.35
(Character of propagation in some species of the genus Taraxacum L.).
J. Bot. U.R.S.S. 1937 : 22 : 267-95.
 The chromosome number of *T. kok-saghyz* proved to be $2n = 16$; this is the normal diploid number. Pollen formation was normal, the pollen had $n = 8$ chromosomes and was 100 per cent fertile, though the viability was lost in about five days. Embryo sac development is also normal. The plants are mainly self-sterile but on pollination from another plant 100 per cent fertility was usually observed. Pollen of other fertile species will also effect fertilization, but not pollen from parthenocarpic species which seems to be of very reduced viability. The pollen grains have been seen to traverse the 9 mm. of the style in 10-15 minutes, and fertilization occurs after 15-20 minutes. The process of fertilization was followed and is described. Certain minor abnormalities, such as the presence of supernumerary egg cells and sperms were observed.
 Several other diploid species namely *T. multiscapitatum*, *T. nutans* and *T. vernale* entirely resembled *T. kok-saghyz* in their reproductive process. Other species, characterized by parthenogenetic reproduction, proved to be tetraploid, triploid or pentaploid. The various anomalies associated therewith are described and illustrated. The authors are of the opinion that the genus is predisposed to parthenogenesis, which has been furthered by hybridization and the ensuing polyploidy.
 For improvement in *T. kok-saghyz* the ordinary breeding methods can be adopted. *T. hybernum*, however, which is one of the parthenogenetic species ($4x = 32$), requires special breeding methods, in view of the fact that new forms cannot be produced by inbreeding or hybridization. The only line of improvement would appear to be the artificial induction of mutations. The occurrence of parthenogenesis in so many species limits the possibilities of improvement by interspecific crossing even in *T. kok-saghyz*.

TURPENTINE AND RESIN PLANTS 633.94

418.

VERHOEF, L.

633.94:575.42(92.2)

633.95

Iets over harsen, in het bijzonder damar en copal. (On resins and damar and copal in particular).

Bergcultures 1938 : 12 : 516-23.

In this article which deals largely with the promotion, improvement and methods of resin production the botanical sources of damar and copal are considered with notes on different species and their occurrence in the Dutch East Indies.

Selection could, it is suggested, be applied in the resin production industry, in which hitherto the main source of supply has been from uncultivated trees; a marked difference in the bals of high and low producing trees of *Agathis* has been recorded as well as a very wide range of variation in individual output, so that promising material for selection is apparently available.

SAP PLANTS 633.95

419.

GOLUBINSKIJ, J. N.

633.956:576.356.5

A tetraploid form of *Ocimum canum* Sims. experimentally produced.

C.R. (Doklady) Acad. Sci. U.R.S.S. 1937 : 15 : 261-62.

One tetraploid shoot is described, obtained by the method already used by the author. It was characterized by a denser pubescence and apparently higher camphor content than the normal diploid plants, but the flowers were few and sterile.

FRUIT TREES 634

420.

ALDERMAN, W. H.

634:575(77.6)

Fruit breeding in Minnesota.

Minn. Hort. 1937 : 65 : 43-44.

The early history of fruit breeding work in Minnesota is described, and a short account given of the work done at the Minnetonka Fruit Farm since its establishment in 1878. It is estimated that at the time of writing, 33,000 acres were planted to fruit varieties produced at the farm. It is pointed out that it takes from 10 to 25 years to produce a new fruit variety, and the work is of such a long-term nature that it cannot be extensively conducted by private breeders.

421.

ANDREEV, V. N.

634:575.127(47)

(The varieties of I.V. Michurin in the Kuibyšev region).

Plodoovoščnoe Khozaistvo (Fruit and Vegetable Growing) 1938 : No. 6 : 61-63.

Observations on a number of Michurin's fruit tree varieties have confirmed their exceptional resistance to cold. Work on the lines laid down by Michurin is being continued and reference is made to a number of the new promising varieties of apples and pears. A number of very hardy local forms of sour cherry have been isolated in the Volga region, and large numbers of hybrids of other fruits are also under examination.

422.

PETROV, A. V.

634.11:575

(Main problems in apple breeding).

Plodoovoščnoe Khozaistvo (Fruit and Vegetable Growing) 1938 : No. 4 : 46-49.

The cardinal importance of extensive and suitable initial material is illustrated by reference to Michurin's work and brief descriptions are given of the most suitable parental varieties, including Michurin's, Central Russian and North American varieties. The technique of pollination and of dealing with the hybrid seedlings is described. Indications are given of the varieties known to be transmitters of definite qualities such as quick bearing and fruit quality.

423. NORDMANN, R. O. 634.11:575(43)
Züchtungsziele bei der Neuzüchtung von Apfelsorten. (Aims in breeding new varieties of apples).
 Obst- u. Gemüseb. 1938 : 84 : 18-19.
 Some of the distinctive features of the high grade varieties of apples from U.S.A., England, and Germany are mentioned and the necessity of cross-breeding to combine in one variety fine flavour and aroma with firm, crisp, juicy flesh. The possibility of introducing disease and pest resistance by hybridization with wild crab apples is pointed out. The use of the English type of apple with large, sourish fruits is recommended for hybridization purposes in preference to the sweeter but less valuable American type.
 The work should be undertaken at Government Institutes. The need for establishing official collections of all known varieties of fruit trees in the form of collections of "type plantations" (Obstmuttergärten) for each of the various fruits, each institute being responsible for particular species of fruits, is indicated.
424. IVANOV, P. P. 634.11:575(47)
 634.11:575.127.5:634.13
(An expert in new varieties).
 Plodoovoščnoe Khozaistvo (Fruit and Vegetable Growing) 1938 : No. 8-9 : 59-60.
 Reference is made to the work of S. F. Černenko who has produced a number of improved apple varieties which are described, and a hybrid between apple and pear.
425. TETEREV, F. 634.11:575(47)
(Our country's golden varietal stock).
 Plodoovoščnoe Khozaistvo (Fruit and Vegetable Growing) 1938 : No. 4 : p. 60.
 Reference is made to the value of the initial material existing in the U.S.S.R. Two new apple varieties, produced by the Mleev station by crossing Winter Golden Pearmain and Ladsberg's Reinette with Calville Snow, bear fruits of exceptionally fine appearance and flavour.
426. LEONOV, I. M. 634.11:575(57)
 634.11-2.111-1.521.6
(Apple breeding in Siberia).
 Plodoovoščnoe Khozaistvo (Fruit and Vegetable Growing) 1938 : No. 4 : 50-54.
 Thousands of apple crosses have been made by Michurin's disciples in the effort to produce frost-resistant forms capable of cultivation in Siberia. Methods of estimating frost resistance are of primary importance. Observations over a five year period have indicated that the varieties in which the vegetation period terminates earliest are not always the hardiest; e.g. the variety Purple Reinette grows till late in the season but is the hardest of all. On the other hand early inception of the vegetation period (bursting of the buds) has been found to be a very reliable index of winter-hardiness; the bursting of the buds is influenced by conditions of growth and observations must be made on forms growing under identical conditions. The differences, and also the correlation with hardiness, are more evident after severe winters than in mild seasons. Another index of cold resistance is absence or low degree of pubescence on the leaves. All these characters, early bud bursting, glabrous leaves and frost resistance are correlated with smallness of fruit, and size of fruit must, therefore, be introduced from the other parent.
427. LANTZ, H. L. and 634.11:575(77.7)
 PICKETT, B. S.
Performance of apple varieties in the variety test orchard in 1937.
 Trans. Ia Hort. Soc. 1937 : 72 : 92-99.
 Notes are given on the characteristics of the following varieties, bred at Iowa State College: Joan, Secor, Edgewood, Hawkeye, Sharon, Earlham, Ames and Maud.

428. SCHWIEGERSHAUSEN, K. 634.11:575.182
 Xenienbildung bei Aepfeln. (**Xenia in apples**).
 Obst- u. Gemüseb. 1938 : 84 : p. 14.
 Xenia in apples is, in the writer's opinion, much commoner than is suggested by its demonstration in one particular experiment. As a further instance the fruit from pollination between Ontario and Zuccalmaglio-Reinette is here illustrated side by side with the fruits of the parent forms.
429. FRISCHENSLÄGER, B. 634.11:575.183
 634.13:575.183
 Versuche über den Einfluss des sortenfremden Blütensaubes auf die Ausbildung des Fruchtfleisches bei einigen Birn- und Apfelsorten. (**Experiments on the influence of the pollen of other varieties on the development of the flesh of the fruit in certain apple and pear varieties**).
 Gartenbauwiss. 1938 : 12 : 138-44.
 Four-year-old trees of Diels Butterbirne and Pastorenbirne, and of London Pippin and Ontario apples, were artificially pollinated so that each variety received pollen from two different varieties. In each case, considerable differences in keeping quality and flavour were found between the fruits pollinated by the two pollen parents. The pollen can thus exercise a direct effect on the development of the fruit of apples and pears.
430. HUREL-PY, G. 634.11:576.312.35
 634.11:581.162.5
 Étude caryologique de quatre variétés de pommiers de la région d'Angers.
 (**Cytological study of four varieties of apple from the Angers region**).
 Bull. Soc. Nat. Hort. Fr. 1938 : 5 : 37-40.
 The varieties Reinette Clochard, Reinette du Mans, Reinette Pepin and Grand-Mère all proved to be diploids ($2n = 34$) with high pollen fertility.
 The variety Reinette Clochard is self-sterile, but yields fruit when pollinated by the variety Sainte-Germaine.
431. MARTIN, J. N. 634.11:581.162.51:581.331.2
 Cytological and morphological features associated with impotency of pollen of the Winesap apple.
 Iowa St. Coll. J. Sci. 1938 : 12 : 397-404.
 The Winesap apple shows a high degree of pollen abortion, in spite of the fact that it is a diploid with apparently normal meiosis. This is due primarily to a reversal of the normal relationship between the pollen mother cells and the tapetum. The latter develops abnormally and in some cases practically fills the locule, leaving little space for pollen development. Tapetal cells are able to digest the pollen instead of being digested by it. Abnormal development of the pollen sac wall cells also occurs.
432. DIMOŠIN, S. I. 634.11-2.111-1.521.6(47)
 634.13-2.111-1.521.6(47)
 (**On the advice of a great scientist**).
 Plodoovoščnoe Khozaistvo (Fruit and Vegetable Growing) 1938 : No. 6 : 65-66.
 Following Michurin's principles of breeding, P. G. Šuranov has produced two apple varieties, Šuranovka Nos 1 and 2, resembling the local varieties but excelling them in length of life, yield of fruit, keeping quality and vigour of growth. He has also selected forms of *Pyrus ussuriensis* of improved flavour, three of which are described. Three of his new hardy pears are also described.

433. SCHMIDT, M. 634.11-2.42-1.521.6:575
Venturia inaequalis (Cooke) Aderhold. VIII. Weitere Untersuchungen zur Züchtung schorfwiderstandsfähiger Apfelsorten. (Erste Mitteilung). [*V. inaequalis* (Cooke) Aderhold. VIII. Further investigations on the breeding of varieties of apple resistant to scab. (First communication)].
 Züchter 1938 : 10 : 280-91.
 An account is given of the ways and means employed in the search for apple varieties resistant to scab. Of the various species tested, *Malus coronaria* and *M. micromalus* have shown no trace of scab over a six-year period and some other species were only slightly attacked. Numerous crosses of *Malus* species and *Malus* species x cultivated varieties and of cultivated species have been investigated. The many difficulties, such as the dominance of the small fruit and tannic acid content of the wild species, etc. are discussed and also whether these are linked with resistance to scab. The problem of physiological races of the fungus has also to be considered.
434. TIKHONOV, N. 634.22:575.127.2
(The plum "Far Eastern Dessert"). 634.22 Far Eastern Dessert
 Plodoovoščnoe Khozaistvo (Fruit and Vegetable Growing) 1938 : No. 5 : 66-67.
 The variety described was obtained by crossing Hansen's variety Opata with the Manchurian black plum and grafting the hybrids on to one year old seedlings of *Prunus ussuriensis*. It is very frost-resistant and the fruit is of good quality and flavour and ripens at the end of August.
435. TOENJES, W. 634.23:575 "793" (77.4)
The Seneca cherry for trial planting in Michigan. 634.23 Seneca
 Quart. Bull. Mich. Agric. Exp. Sta. 1938 : 21 : 20-21.
 The Seneca sweet cherry bred by the New York Agricultural Experiment Station should be of considerable value in Michigan, as it matures two to three weeks earlier than other varieties. It is of good yield and quality and evades the cherry fruit fly and black cherry aphid because of its earliness, but for the same reason it is particularly liable to depredations by birds.
436. COWART, F. F. 634.25:575(73)
New peach varieties.
 Circ. Ga Exp. Sta. 1936 : No. 109 : Pp. 4.
 Brief accounts are given of the more valuable new peach varieties under observation at the Georgia Experiment Station.
437. 634.25:575(74.9)
 634.256:575(74.9)
New twentieth century peaches bred and tested in New Jersey.
 Propagated and distributed by the N.J. Peach Coun., New Brunswick, N.J.
 1938-1939 : Pp. 13.
 The parentage and characteristics of seven new peach varieties bred by the New Jersey Agricultural Experiment Station; Triogem, Newday, Golden Globe, Sunhigh, Goldeneast, Summercrest and Afterglow and one nectarine, Golden State Nectarine (U.S. Plant Patent 92) are given.
438. JOHNSTON, S. 634.25:575(77.4)
The Kalhaven peach. 634.25 Kalhaven
 Quart. Bull. Mich. Agric. Exp. Sta. 1938 : 21 : 19-20.
 The Kalhaven peach is a yellow freestone variety maturing from four to seven days before Elberta. A full description of the variety is given.

439. SHAMEL, A. D. 634.25:575.252
A Saucer peach bud variation.
J. Hered. 1938 : 29 : p. 259.
A mutant branch on a peach tree of the Saucer variety produces peaches very like those of the Lukens Honey variety, suggesting the possibility that Lukens Honey may have originated as a bud mutation of Saucer.
440. CANDIOLI, P. 634.25 Reale di Pescantina (Fontana N.6)
Nuova varietà di pesco riscontrata nel Veronese "Reale di Pescantina", (Fontana N.6). [A new variety of peach from the Verona district "Reale di Pescantina" (Fontana N.6)].
L'Ortofruttic. Italiana 1938 : 7 : 137-39.
A description of the new variety—a bud mutation from Amsden. It is resistant to disease and possesses good agronomic and commercial qualities.
441. PRATASSENJA, G. D. and 634.25:576.356.5
TRUBITZINA, E. M.
Production of polyploid plants. A triploid in *Prunus persica*.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1938 : 19 : 531-33.
A large number of peach varieties were studied at the tetrad stage, and the percentage of dyads determined. This varied from 0·1 per cent to 18·9 per cent according to the variety. Pollen of the varieties which showed 9 per cent or more dyads was examined under a binocular microscope. Large grains were picked out, in the hope that they were diploid, and used to pollinate bagged flowers. In this way two triploid plants were obtained. It is hoped that polyploid peaches may prove to be more cold-resistant than diploids.
- CITRUS FRUITS 634.3**
442. LAPIN, V. 634.3:575(47)
(Problems concerning the hybridization of citrus fruits).
Soviet Subtropics 1938 : No. 7 (47) : 34-37.
The absence of hardy forms among the existing citrus types and the ease with which these cross with the related wild genera has led to the extensive use of wide crossing. The defects of many of the hybrids from *Poncirus* are pointed out and attention is now being directed to *Fortunella* and to such species as *C. Junos*, *C. ichanensis* and to *Microcitrus*, *Eremocitrus*, etc. The following forms are mentioned as being suitable maternal parents on account of their low proportion of polyembryony: *F. japonica*, *F. Margarita*, *C. Medica* and *C. Limonia*. *C. Unshiu* has been observed to produce viable pollen in the second period of flowering that sometimes occurs in cases of drought. Flowers from wood of different ages vary in their set of fruit.
Hybrids between two diploid species have often proved to be triploid owing to the fertilization of an unreduced egg cell; in such hybrids, characters of the pollen parent that are normally dominant frequently behave as recessives, a point of great practical importance when working with species possessed of certain undesirable dominants. Polyploids may have a practical superiority in respect of such characters as tolerance of unfavourable conditions, vitamin and sugar content and seedlessness. The proportion of triploids varied in different crossings, e.g. 6·67 per cent in *C. Limonia* x *C. paradisi* whilst *P. trifoliata* x *C. paradisi* gave none at all. The results indicate that the duplication takes place in the egg cells, and giant pollen grains are only rarely observed, e.g. in Shiva-mikan there are 0·4 per cent and this form when open-pollinated produces as many as 11·63 per cent triploids. Hypertriploids with 28 chromosomes instead of 27 are occasionally observed.

443. TOPURIDZE, K. 634.3:575.127.2:578.08
(The technics of crossing wild orange trees).
 Soviet Subtropics 1938 : No. 2 (42) : 41-48.

The prevailing requirements as regards frost resistance, quality (flavour and chemical composition including vitamin content), yield, etc. are enumerated for various citrus species and 27 suitable crosses between different species are suggested as likely to improve particular characters such as earliness, yield, flavour or frost resistance. The desired species combination and the parent plants having been chosen, hybridization should be carried out on the lines described in detail under the following heads: collection and storage of pollen, germination tests, emasculation and pollination. Full particulars are also given of the equipment required and method of keeping records at various stages. As regards the collection and storage of the fruits it is explained that the seeds should not be extracted until sowing time, as otherwise they soon lose their germinating capacity.

444. SOKOL'SKAJA, B. P. 634.3:581.481:575
(On polyembryony in seeds of citrus).
 Soviet Subtropics 1938 : No. 4 (44) : 66-67.

Sixteen varieties or forms of citrus, comprising oranges, lemons, mandarins and pomelos, were used to estimate the relative frequency of polyembryony, which was found to increase with the age of the seeds.

The largest number of embryos was found where the individual embryos were small, but such embryos often fail to develop while the larger and average sized embryos do.

Polyembryony and its degree of expression, as estimated by the number of embryos formed constitute an hereditary character which could be used in the systematic classification of varieties and other forms of *Citrus*. The different species in the experimental material showed marked variation in the number of embryos formed, a fact which could be used in hybridization to reduce the frequency and degree of polyembryony.

445. MAURI, N. 634.3-1.541.11:575.42
Méthodes possibles de selection du port-greffe chez les agrumes. (Possible methods of selection of citrus stocks).
 Rev. Hortic. Agric. Afr. Nord. 1937 : 41 : No. 2.

The methods discussed may be either, (a) genetical or (b) vegetative. Under (a) are included all methods of seed selection and under (b) methods of vegetative propagation of the plants of the desired type.

446. SOKOLSKAIA, B. P. 634.31:581.148:581.46
(A new method of raising the yielding capacity of orange trees).
 Soviet Subtropics 1938 : No. 3 (43) : 60-61.

The drop of orange flowers was considerably reduced by removing the styles, 22 fruits being obtained from 39 operated flowers, and only one from 35 flowers in the control group. The fruits obtained by operation were larger than the controls and were seedless and, in some cases, superior in flavour.

Probable causes of the increase in yield following the removal of the style and the possibility of applying the operation to induce parthenocarpy in other plants are suggested.

447. PACHEV, A. G. 634.322:581.162.3
(Pollen activity in Unshiu mandarins).
 Soviet Subtropics 1938 : No. 6 (46) : 31-36.

The author maintains that it is possible in a suitable environment to obtain adequate and functional pollen for breeding operations from the Unshiu mandarin. Osawa's explanation of the male sterility of this orange tree as due to hybrid origin is examined, as well as the views of other workers.

448. SHANIDZE, V. 634.331:575.127.2:634.334

(A valuable variety of citron).

Soviet Subtropics 1938 : No. 7 (47) : p. 77.

Among the collection of citron (*Citrus medica*) at the Batum Botanical Gardens an Italian form, Di Calabria, has attracted attention; its fruits contain a high percentage of essential oil (1·04 per cent) and have a characteristic aroma. Crossings of the form have been made with local varieties of lemon and the hybrid seeds have just been sown.

449. YESINOVSKAYA, V. N. 634.334:575.127.2:634.321

(The first hybrid produced from the crossing of a lemon tree with *P. trifoliata*).

Soviet Subtropics 1938 : No. 6 (46) : 36-37.

Particulars are given of the stem, leaf, flower and fruit characters of the hybrid obtained by crossing the lemon and *Poncirus trifoliata*. The fruits, which are large, pear shaped, yellow and pubescent with a rather rough, thick, loose rind. The aroma is peculiar and recalls the odour of the apple, while the yellow flesh is juicy and sour but with no trace of bitterness. The hybrid is regarded as equal to *P. trifoliata* in frost resistance.

The skin must be removed before using the fruits as its essential oil smells like that of *trifoliata*.

450. HALMA, F. F. 634.334-1.541.1:575.42

Important considerations in selection of lemon scion varieties.

Calif. Citrogr. 1937 : 22 : 493, 506.

Experiments illustrating the importance of selecting good varieties for scions and notes on the points to be considered in selection.

VARIOUS SMALL FRUITS 634.4

451. AKHUN-ZADE, I. 634.451:575“793”(47)

634.451 Skorospelka

(A new variety of persimmon “Skorospelka”).

Soviet Subtropics 1938 : No. 3 (43) : p. 100.

A detailed note on a newly discovered seedless persimmon of excellent flavour though the fruits are small. The new tree which was found in a district in Azerbaijan is to be used for multiplication and studied to see whether on pollination dark fleshed fruits with seeds could be obtained. The fruit ripens in October and no frost injury has been noted.

452. AKHUND-ZADE, I. 634.451:581.141

634.451:575-181

(Parthenocarpic specimens of the persimmon).

Soviet Subtropics 1938 : No. 2 (42) : p. 109.

Three seedless specimens of the Caucasian and Italian persimmons (*Diospyros Lotus*) have been discovered by the Zakatal Experimental Station for Subtropical crops. The trees had larger fruits than usual with a much better flavour. Breeding experiments should be begun to increase the size of the fruit.

453. AKH. Z. 634.451:581.163

(Parthenocarpic forms of Caucasian persimmon).

Soviet Subtropics 1938 : No. 6 (46) : 87-88.

The fruit (*Diospyros Lotus*) and its uses, its chemical composition and distribution in the U.S.S.R., are described with an account of a new and probably valuable parthenocarpic variation which is thought to have arisen from a bud mutation on a tree of unknown origin. The main advantage of the new form lies in the seedlessness of the fruits.

NUTS 634.5

454. LOUNSBERRY, C. C. 634.51(77.7)
Late developments in nuts for Iowa.
 Trans. Ia Hort Soc. 1937 : 72 : 141-43.
 The characteristics of some new varieties of walnuts and shagbark hickories from Iowa State College are briefly described.
455. RIPPERTON, J. C., 634.57:575(96.9)
 MOLTZAU, R. H. and
 EDWARDS, D. W.
Methods of evaluating the macadamia nut for commercial use and the variation occurring among seedling plantings in Hawaii.
 Bull. Hawaii Agric. Exp. Sta. 1938 : No. 79 : Pp. 26.
 The macadamia nut (*Macadamia ternifolia*) is grown in Hawaii and packed commercially, after shelling, roasting and salting, as a canned product. Two types occur, the rough-shell and smooth-shell types. The former is very variable in flavour and quality and the tree is susceptible to attacks by numerous insect pests. It will probably be almost completely replaced by the smooth-shell type. Tests are described which will be of practical use in breeding and selection work in determining the quality of nuts produced by a given tree. The specific gravity of the nut is found to be very closely correlated with the percentage of oil and cooking quality. A system of grading by flotation in a series of salt solutions and alcohol-water mixtures of varying specific gravity is described.
 Great tree-to-tree variation in quality and yield is found. Commercially, the nuts could be sorted into three grades by flotation in tap water and in a salt solution of specific gravity 1.025. It is suggested that nuts should be bought on the basis of the percentage of sizable Grade I kernels found in a representative sample.
456. HIGGINS, B. B. 634.58:575(75.8)
Peanut breeding.
 Proc. 39th Annu. Convent. Ass. S. Agric. Wkrs, Atlanta, Ga 1938 : 57-58.
 (Abst.).
 Efforts are being made to produce for use in Georgia a "bunch" peanut variety with high yield, disease resistance, and seed requiring a period of dormancy before germination; a runner variety with high yield and earlier maturity than Carolina Runner, and a high-yielding large-seeded variety with nuts of good quality for the confectionery trade. Selections have been made from hybrid material, and preliminary variety tests indicate that some of the lines are very promising. Genetic studies on seed coat colour and habit of growth indicate that the inheritance of these characters is complex. Resistance to two leaf-spotting fungi seems to be determined by a single factor for each fungus. Most of the selections made show a high degree of resistance to *Sclerotinia rolfsii*, but genetic analysis of this resistance has not yet been possible.
- PALMACEOUS AND OTHER FRUITS 634.6**
457. PROOSS, A. G. 634.64:575(47)
(Pomegranates of the Sourkhan-Daria Region).
 Soviet Subtropics 1938 : No. 3 (43) : 27-37.
 Descriptions of varieties, their characteristics, performance and distribution, with occasional notes on their possible uses as breeding material.
458. PROOSS, A. G. 634.64:576.312.35:576.312.34
(A cytological study of the pomegranate of Central Asia).
 Soviet Subtropics 1938 : No. 3 (43) : p. 78.
 Root tips of the varieties Kok (syn. Kazake), Kyzyl, Šar-sabzy and Kadan had $2n = 18$

chromosomes. Cell size and chromosome size were the same in all four species. Šar-sabzy exhibited a pair of satellite chromosomes not found in the other forms, probably owing to difficulties of preparation. No morphological differences in the chromosomes of the various forms were noted and it is suggested that these varieties are very probably closely related, any distinctive characters having been acquired as a result of ecological and geographical influences.

459. EICHHORN, A. 634.651:576.312.35
Étude caryologique du Carica Papaya. (Karyological study of C. Papaya).

Cytologia, Tokyo 1937 : Fujii Jubilee Vol. : 447-48.

A study of the behaviour of the nucleolus during mitosis. The somatic chromosome number is 18.

SMALL BUSH FRUITS 634.7

460. KOSTINA, V. N. 634.711:575(47)
(The best raspberry hybrids at the Mleev Experiment Station).
 Plodoovoščnoe Khozaistvo (Fruit and Vegetable Growing) 1938 : No. 4 : 62-63.

The aims and methods of raspberry breeding at the Mleev station are outlined and the best hybrids described. The most promising is a hybrid, English x Cuthbert, characterized by vigorous growth, upright shoots, winter-hardiness, excellent yield and large fruits superior to both parents in flavour. Some of the hybrids are early in maturity, others late, thus tending to extend the season. Further crossing with the variety Prussia is being effected to increase the size of fruit.

461. HAHN, G. G. 634.72-2.452-1.521.6:575.11
Blister rust susceptibility studies of naturally pollinated seedlings of the immune Viking currant.
 J. For. 1938 : 36 : 737-47.

The Viking red currant (syn. Rød Hollandsk Druerips) is a Norwegian variety immune to white pine blister rust, *Cronartium ribicola* Fischer. It is probably closely related to or may even be identical with the immune variety, Rote Holländische, of Tubeuf.

The probable parentage of this immune variety is discussed and the possibility of obtaining immune seedlings was tested by growing seed isolated from other varieties and seed from plants which had been exposed to cross-pollination. The seedlings were artificially inoculated. Only a small percentage of the seedlings was susceptible. The results show the dominant character of resistance and indicate that multiple factors are involved in the inheritance.

462. KOSTINA, V. N. 634.725:575(47)
(The hybrid stock of gooseberries at the Mleev Experiment Station).
 Plodoovoščnoe Khozaistvo (Fruit and Vegetable Growing) 1938 : No. 4 : 60-62.

On the basis of observations of a large number of crosses, indications are given of the most promising combinations in respect of such qualities as resistance to *Sphaerotheca*—many of the most resistant being hybrids of gooseberry x currant—spinelessness and form of bush. The best hybrids have berries 2-3 times the size of those of the standard variety, Houghton (Khauton), and are described.

463. ŽELEZNIKOVA, V. I. 634.75:575(47)
(New varieties of strawberry at the Mleev Experiment Station).
 Plodoovoščnoe Khozaistvo (Fruit and Vegetable Growing) 1938 : No. 4 : 63-64.

The aims and scope of the hybridization work are described, followed by an account of the six best hybrids, all of which have proved superior to the standard varieties.

464.

634.75:575(49.2)

634.0014(49.2)

Verslag van den Proeftuin te Breda over de jaren 1935, 1936 en 1937.
**(Report of the Experiment Plot at Breda for the years 1935, 1936
and 1937).**

Pp. 16.

This paper, which contains a general report on fruit cultivation, also gives results of pollination investigations with pears and apples.

Strawberry breeding arising out of research on mosaic has been directed in the first instance to ascertaining the degree of homozygosity of various clones for the main genetic factors. The best strains from this standpoint are seedlings obtained from the five following varieties by selfing: Lloyd George (strain 243), Haagsche Bruine (strain H.Br.), Walsenior (strain 112), Hornet (strain 238) and Pyne's Royal (strain 141). These have been studied from the standpoint of heterosis, degeneration due to inbreeding and their improvement as regards the capacity to breed true. Some of the best have been selfed and the seedlings studied.

The application of Mendelian segregation and the uses of inbreeding and hybridization are briefly mentioned and an outline of the present state of the breeding operations in progress with various strains is presented in tabular form, including a table of those breeding true for fruit colour.

465.

ALEŠIN, E. I.

634.75:575.114:581.331.2.02

(Notes on breeding technique. II. Observation of segregation of characters in strawberry hybrids).

Proc. Agric. Inst. Krasnodar 1937 : Issue 9 : 21-32.

Pollen was treated with ether, chloroform, short day conditions, high and low temperature and infra-red rays. Leaf measurements made on the hybrids showed their leaf length to be smaller than that of either of the parents; the length and breadth and leaf index varied in the hybrids from different treatments, the differences being statistically significant. The same was observed in regard to length of petiole. No mutations were observed and the differences caused by the treatment are thought to be brought about entirely by the alteration in the proportion of gametes of the different types that function.

466. Gd.

634.75:575.12

634.75 Bohumir Landovsky

Erdbeere "Bohumir Landovsky". **(The Bohumir Landovsky strawberry).**

Obst- u. Gemüseb. 1937 : 83 : p. 170.

From a cross between Kentish Favourite and Deutsch Evern, the director of the State Research Station for Vegetable Culture at Pruhonice, near Prague, has produced the Bohumir Landovsky variety, named after his son. It is remarkable for its earliness, resistance to diseases, uniformity of the fruits and their shape, colour, delicious flavour and high commercial value.

467.

ROCKHILL, H.

634.75:575.242

Mutations and reversions in the strawberry.

Trans. Ia Hort. Soc. 1937 : 72 : 134-38.

Cases of mutation to the ever-bearing habit and back to normal are recorded, together with some related, unexplained phenomena.

468.

SCHIEMANN, E.

634.75:577.8:575

Geschlechtsvererbung bei Fragaria. **(The inheritance of sex in Fragaria).**

Ber. Dtsch. Bot. Ges. 1938 : 56 : 161-62.

A report of a lecture in which a review is given of the examples of the "mechanical sex" ratio of 1 : 1 in dioecious strawberries.

By crosses between the dioecious *F. elatior* and hermaphrodite diploid species (*elatior* x *collina* and *elatior* x *nipponica*) fertile tetraploid hybrids have been produced and their segregation for sex has been studied.

In both crosses the dioecious plants pollinated with pollen from the hermaphrodite plants gave a 1 : 1 ratio of female and male plants which establishes the heterogamy of the female sex. A study of later generations has shown that after the F_2 hermaphrodite plants occur among the progeny in definite ratios.

469. BAUER, G. 634.753:575.42

Monatserdbeere "Rügen selecta". (**The perpetual alpine strawberry "Rügen selecta"**).
Obst- u. Gemüseb. 1937 : 83 : p. 15.

This new type, isolated from the "Rügen" variety after 3 years of selection, is recommended for its yield and its resemblance in flavour to the wild strawberry.

470. COLLINS, J. L. and 634.774:581.163:581.162.5

KERN, K. R. 634.774:575.24
Studies of the causes of seediness in the Cayenne pineapple.
Proc. Hawaii Acad. Sci. 1937 : Spec. Publ. No. 31 : Pp. 1.

The seedlessness of the Cayenne variety is due to self-incompatibility, pollen tubes penetrating only one sixth of the length of the pistil. Occasional seedy fruits occur, their frequency being subject to seasonal and annual fluctuations. Wild pineapples are seedy and seedy clones can be established in the Cayenne variety. They arise as dominant mutations and their pollen will cause seediness in normal Cayenne plants.

VITICULTURE 634.8

471. ZWEIGELT, F. 634.83-1.521.1

Der derzeitige Stand der Selektionsarbeiten im Weinbau der Ostmark als Grundlage für die Rebenanerkennung. (Referat am Kursus für Rebenanerkennung in Worms am 9. August 1938). [**The present position of work on selection in the viticulture of the Ostmark as a basis for the certification of vines. (A survey at the course for vine certification in Worms on 9th August, 1938)**].

Weinland 1938 : 10 : 269-71.

The early difficulties and work of the Bundes-Rebenzüchtungs-station (Federal Vine Breeding Station) on the problems of the selection of vines and on the production of new varieties of improved quality by hybridization are described, with information on the development of the investigations on vine selection in Austria and at Klosterneuburg in particular.

Studies of development in the vine have shown the difficulty of identifying late and early types.

At the present day vine certification and pedigree recording are among the achievements resulting from the activities of the Verband der Rebenzüchter Österreichs (Association of the Vine Breeders of Austria) established in 1927. Selection of stocks is also receiving due attention.

472. HUSFELD, B. 634.835:575

Wichtige Kreuzungsergebnisse bei der Rebe. (**Important results of hybridization in the vine**).
Züchter 1938 : 10 : 291-99.

The most important results of vine-breeding are briefly reviewed; these include the characters segregating in mono- or polyfactorial ratios, correlation phenomena, the breeding for disease resistance by means of species crossing and the inheritance of sex.

473. NEGRUL', A. M. 634.835:575
(How to produce grape varieties with desired qualities).
 Plodoovočnoe Khozaistvo (Fruit and Vegetable Growing) 1938 : No. 4 :
 57-59.

Varieties suitable for introduction into new vine areas in the north and east are recommended. New varieties can be produced by sowing the seeds from existing forms and the best varieties for this purpose are indicated; for the production of hardy forms hybrids with *V. Labrusca* and *V. amuriensis* are thought to be promising sources of seedlings. Indications are given of the inheritance of certain economic characters and the principles to be followed in the choice of parents in crosses involving these characters (cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 1337).

474. ZWEIGELT, F. 634.835:575(43)
 634.835:575(43.6)
Die Aufgaben der Rebenzüchtung. Vortrag gehalten auf der ersten Reichstagung des deutschen Weinbaues in Heilbronn am 24. August, 1937.
(The functions of vine breeding—Lecture given at the first state conference on German viticulture at Heilbronn on 24th August, 1937).
 Weinland 1937 : 9 : 388-92 ; 1938 : 10 : 25-26, 52-54.

In summarizing the aims and manifold problems confronting the viticulturist in Northern Europe, and present-day Germany in particular, the view is expressed that improvements in yield must be limited by requirements as regards quality. The aim in selection will therefore be to combine high quality with reliability in regard to a good yield. Individual selection has replaced mass selection and a pedigree register for the best quality clones has been established in Austria. Frost resistance and reliable flowering were also included in the selection programme, but resistance to diseases and pests are still problems for solution.

Though the chaos formerly prevailing in the identification of varieties has been cleared up, further work remains to be done in purifying the individual varieties by eliminating locally adapted types which, though closely resembling recognized varieties such as the Green Veltliner, only do well in their own locality. Numerous small centres will be needed for testing such forms and the results of the trials must be evaluated with reference to the specific locality in question. Also degeneration in clones and the occurrence of bud variations and mutations will necessitate continual testing of such material. The Riesling-Sylvaner variety of Müller Thurgau which was propagated from a seedling is instanced as a clone to which selection in Austria has been applied on account of the occurrence of such new types.

Similarly, stocks propagated as clones will need continual selection having regard to the fact that they are usually of hybrid origin and in view of the types of variation referred to by Michurin, Navarro and Lysenko as well as the possibility of bud mutations. The role of climate and soil in variation must also be considered.

Ultimately the improvement attained by selection of existing types and mutations must be supplemented by new material obtained by hybridization. Here three aims are clear: improvement of existing high quality vines for the production of dessert fruit or wines; the improvement of stocks; and the production of direct producers resistant to diseases and pests. The difficulties of genetical studies of vines are summarized and the practical achievements of German workers in this field are acknowledged, together with the researches of Pirovano on electro-genetics, Michurin and the Swiss, Czechoslovak and Rumanian investigators.

The second part of this paper mentions successful crosses made at Gueixendorf between Zierfahndler and varieties such as Welsch-riesling, Gutedel, Orange-traube, Rotgipfler, Riesling and Madeleine angevine. The resulting hybrids are early maturing and have the characteristic Riesling bouquet. Czechoslovakia and Styria are also producing some good hybrid vines.

The vegetative propagation of direct producers is also receiving attention. The third section of the paper is devoted mainly to the problems pertaining to the breeding of direct producers and the value of various hybrid forms bred in France, Italy and Germany. It is finally concluded that American varieties must be eliminated and the production of direct producers of *vinifera* should be aimed at. Good hybrids of this species should be suitable to a wide area.

475. MURPHY, M. M. (Jr) 634.835:575(75.8)
 PICKETT, T. A. and 634.835 Creek
 COWART, F. F. 634.835 Dawn
Muscadine grapes. Culture, varieties, and some properties of juices.

Bull. Ga Exp. Sta. 1938 : No. 199 : Pp. 32.

Inter alia two outstanding seedlings released by the Georgia Experiment Station in 1938 are briefly described, Creek and Dawn. Creek has the thinnest skin of all varieties and Dawn is the earliest of all varieties. Descriptions and data on the physical and chemical characteristics of varieties in cultivation are given.

476. FIALA, A. 634.835:575.22(43.7)
 Die bei der Selektion des Furmint beobachteten Variationen bei der staatlichen Versuchsanstalt in Malá Toroňa. (**Variations observed in the selection of Furmint at the Malá Toroňa Experiment Station**).

Weinland 1937 : 9 : 377-80.

Selection applied to vines should be combined with records of the behaviour in the progeny of the particular characters concerned.

In selection work at the state experiment station at Malá Toroňa three variations have been observed in the Furmint vine and are here described. Two of the new types are of satisfactory quality and are being used in further grafting operations. The third is an undesirable form. Each of the three has a distinctive leaf type.

477. SCHEU, G. 634.835:575.42
 Entwicklung und Stand der Rebenselektion und -Anerkennung im Altreich.
(Development and state of vine selection and certification in former Germany).

Weinland 1938 : 10 : 328-31.

- ZWEIGELT, F.
 Von der Rebenzucht-Anstalt der Landesbauernschaft Hessen-Nassau in Alzey. (**On the Vine Production Institute of the District of Hessen-Nassau in Alzey**).

Weinland 1938 : 10 : 267-69.

A detailed account is given of the methods of selection for the past 30 years, beginning with the development of viticulture in Rhenish Hessen. Among the problems dealt with were the improvement of yield and the establishment of clones and the inauguration of clone tests. Another step with important unexpected results was the study of earliness in the course of which leaf roll disease of the vine was identified as a concomitant of degeneration phenomena and as transmissible from one generation to another. Selection against this malady was effectively undertaken.

In 1920-21 increased facilities became available and valuable work has been done on the selection of suitable stocks, on the relation between the age of the parent vine and the yield of its progeny and on the statistical requirements in the testing of a clone—an investigation which led to the discovery of high yielding types. The beginnings of measures for vine certification were instituted in 1921.

The second paper is an appreciation of the work of Georg Scheu in vine improvement and research.

478. ZWEIGELT, F. 634.835:575.42
 Von der Auslesezüchtung. (**Selective breeding**).
 Weinland 1938 : 10 : 268-69.

Under the new régime in Austria new vineyards can be planted only with vines from recognized (certified) vineyards. Selective breeding—either by mass selection, or preferably individual selection—to obtain good clones is naturally an important part of the new programme.

In outlining the two methods of selection, the importance of choosing the most suitable initial type or variety is stressed, with data on the production of some recorded varieties as a guide for future comparisons with the performance of any clones obtained by selection from these varieties. Clones that prove outstanding after some years of testing are entered in the Pedigree Register of Vines.

The Vinebreeding Station at Klosterneuburg is willing to assist growers in the work of selection.

479. OLMO, H. P. 634.835:576.312.35:576.356.5:576.356.4
Chromosome numbers in the European grape (*Vitis vinifera*).

Cytologia, Tokyo 1937 : Fujii Jubilee Vol. : 606-13.

Chromosome numbers of $n = 19$ and $n = 20$ have previously been reported for *Vitis vinifera*. The author examined root tips of 86 cultivated varieties, and found the somatic number of each to be 38. One hundred and twenty-nine seedlings from self-pollinated seed were also examined, and the chromosome number of all but one was found to be 38. The exception was a triploid.

It is suggested that the occurrence of occasional vines with $2n = 40$ may be due to irregular mitotic anaphase separations, both halves of two lagging chromosomes being included in the same nucleus. Clones so derived would be doubly trisomic.

Seedlessness, and the tendency of some varieties to excessive shedding of the flowers soon after blossoming, cannot be attributed to abnormal chromosome numbers.

Tetraploid forms of a number of grape varieties are known. As yet they have no economic importance, owing to their irregular bearing habit.

480. JUNEU, V. 634.835:581.46:575.242
Einige Ausnahmen bei der Blüte der rumänischen Weinrebenarten. (Some anomalies in the flowering of Rumanian vine varieties).

Weinland 1938 : 10 : p. 233.

In the Rumanian variety, Braghina, a new type of flower, "the star-shaped form", has been observed on certain vines. The anomaly has only been occasionally recorded in the variety Gamay and never before in Rumanian forms. It is regarded as a mutation.

Other anomalies of the flower affecting fruiting are described.

481. BREIDER, H. and 634.835-2.7-1.521.6:575
 HUSFELD, B.
Die Schädigung der Rebe durch die radicole Form der Reblaus (*Phylloxera vastatrix*). (The injury to the vine caused by the radicole form of *P. vastatrix*).

Gartenbauwiss. 1938 : 12 : 41-69.

Observations were made on a number of vines, the majority of them the F_2 of the cross *V. vinifera* var. Gamay x *V. riparia* (Vulpina) artificially infected with *Phylloxera*.

It was found that the degree of infection varied considerably, that varieties that took the infection slightly at first might become heavily infected later and vice versa. The effect of infection on the morphology of the plant was investigated and the value of the results for breeding is discussed.

FORESTRY 634.9

482. BUSSE, J. 634.97:575
Forstliche Züchtung. (Breeding of forest trees).
 Dtsch. Forstw. 1936 : 71 : 869-72 ; 72 : 881-83. Also Jber. Dtsch. Forstvereins (1936) 1937 : 453-65.

A general account of the growth and aims of forest tree-breeding. Some of the results already achieved are mentioned and the methods used are described.

483. HUSFELD, B. 634.97:575
 Welche Ergebnisse der landwirtschaftlichen Züchtungsforschung können in der Forstwirtschaft verwertet werden? (**What results of agricultural breeding research can be utilized in forestry?**)
 Dtsch. Forstverein Jber. 1936 : 413-23.
 With regard to breeding, forestry stands much where agriculture stood at the beginning of this century. In this lecture from an agricultural plant-breeder to an audience of foresters some of the results already achieved in plant genetics are described and their possible application to forestry discussed.
484. ROHMEDER, E. 634.97:575
 Die forstliche Pflanzenzüchtung. (**Plant-breeding applied to forestry**).
 Forstwiss. Zbl. 1938 : 60 : 105-18.
 A review of plant breeding as applied to forest trees, including problems, aims and methods.
485. WETTSTEIN, W. v. 634.97:575
 Die bisherigen Ergebnisse der Zuchtwahl bei Waldbäumen. (**The results achieved in the selection of forest trees**).
 Dtsch. Forstw. 1936 : 423-33.
 A general account of the importance of the application of the principles of genetics to the improvement of forest trees. A knowledge of floral biology and the physiology of germination is also essential.
486. HERSHY, J. W. 634.97:575(76.8)
 Starting a pedigreed strain of timber and crop trees in the Forestry Program of the Tennessee Valley Authority.
 Annu. Convent. Northern Nut Gr. Ass. 1937 : September 12-15 : Pp. 11.
 A brief popular account of an extensive programme of tree-breeding and selection work being conducted by the above Authority.
 Attention is being given to a wide variety of trees, for timber production, pig and chicken feeding, and for fruit production.
487. SCHREINER, E. J. 634.97:581.162.3:575:578.08
 Forest tree breeding technique.
 J. For. 1938 : 36 : 712-15.
 The following technique is recommended for breeding forest trees. Branches bearing male flowers are collected and placed in water in the laboratory a day or more before the flowers mature. The pollen is collected as it is shed, and stored in small, labelled, glass vials, each fitted with a cotton wool plug and a small glass pipette with rubber bulb. The vials are stored in a desiccator over calcium chloride.
 The flowers used as female parents are emasculated where necessary, and bagged before they reach maturity. A glassine bag is used, tied around the branch with a plug of cotton wool in the mouth. The glassine bag is in turn enclosed in a paper bag. When the female flowers are ready for pollination, the outer paper bag is removed. The inner bag is punctured with the pipette, and pollen is blown on to the stigmas without removing the bag. The puncture is afterwards covered with adhesive or with another glassine bag, and the paper bag replaced. By using this technique, danger of contamination by pollen floating in the air is avoided.
488. STROHMEYER, G. 634.97-1.547.15:575.42
 Über Auslesegesichtspunkte bei der züchterischen Bearbeitung der Kiefer. (**Viewpoints on selection of pines for breeding**).
 Forstwiss. Zbl. 1938 : 60 : 152-57.
 The importance is stressed of being able to select in the earliest possible stages and for this purpose various morphological and physiological differences in pine seedlings, not only of the same locality but even of the same progeny, are noted. It is possible that some of these are connected with characters of economic value.

489. ROST, H. 634.972.3:575.127.2
Snabbväxande poppelhybrider. (**Rapidly growing poplar hybrids**).
Skogen 1937 : 24 : 455-57.

An account of the work in America on the production of quick-growing poplars by hybridization and their importance for Sweden.

490. VLOTEN, H. v. 634.972.3-2-1.521.6:575.12
Het onderzoek naar de vatbaarheid van populieren voor aantasting door *Dothichiza populea* Sacc. et Briard. (Eerste verslag). [**Investigation into the susceptibility of poplars to *D. populea* Sacc. et Briard. (First Report)**].

Tijdschr. Ned. Heidemaaatsch. 1938 : 50 : 77-92.

Records of the disease caused by *D. populea* Sacc. et Briard in Holland and other countries are cited with observations on its symptoms and the susceptibility of various species and hybrids. Comparative experiments on resistance are being made at various centres in Holland. Under the local conditions at Hoog-Keppel the Tacamahaca poplars and the hybrids of Stout and Schreiner appear to be more susceptible as a group than the Aigeiros poplars. Indications of inheritance of susceptibility are mentioned in connexion with the Stout and Schreiner forms.

It is suggested that in raising new hybrids, trees from the Aigeiros group should be used as parents. A few European-American hybrids exhibit a high degree of resistance, *P. brabantica* Houtzagers, *P. marilandica* Bosc, *P. regenerata* Henry among others. The first of these three is susceptible to *Nectria* and bacterial canker, but others mentioned in this group are resistant to *Nectria*.

The foregoing observations are put forward provisionally since it is possible that under less favourable conditions than those at Hoog-Keppel differences might be discovered among the forms that were there clearly resistant.

Apparently no poplar is immune to *D. populea*.

491. DOORENBOS, S. G. A. 634.972.8:575.12:581.162.5
Kruisingsproeven met iepen te 's-Gravenhage. (**Crossing experiments with elms at the Hague**).
Tijdschr. PlZiekt. 1938 : 44 : 161-64.

The measures adopted in artificial pollination to obtain a collection of elm hybrids are described with notes on the young seedlings and their growth and characteristics. The influence of the pollen parent was clearly seen in many of the hybrids but 6 F_1 seedlings from *Ulmus japonica* x *U. Wallichiana* resembled neither parent.

Grafts of some of the more promising hybrids were made on root suckers of Christine Buisman elm.

492. 634.972.8:581.162.3:578.08
Verslag over de werkzaamheden voor het iepenziekte-comite—verricht aan het Laboratorium voor Erfelijkheidsleer in 1937. (**Report on the activities for the Elm disease Committee—carried out at the Genetics Laboratory in 1937**).
Tijdschr. PlZiekt. 1938 : 44 : 155-60.

An account of the measures taken in making elm crosses by artificial pollination and in the cytological examination of buds.

493. WENT, J. C. 634.972.8-2.42-1.521.6
Compilation of the investigations on the susceptibility of different elms to *Ceratostomella ulmi* Buisman in the Netherlands.
Phytopath. Z. 1938 : 11 : 181-201.

The results of the inoculation of a number of species and varieties of elm with the fungus causing elm disease are recorded. Though several resistant species have been found, many are unsuitable for various reasons for extensive cultivation. The variety "Christine Buisman", a Spanish seedling of *Ulmus foliacea* is resistant and is recommended for cultivation.

chromosomes. Cell size and chromosome size were the same in all four species. Šar-sabzy exhibited a pair of satellite chromosomes not found in the other forms, probably owing to difficulties of preparation. No morphological differences in the chromosomes of the various forms were noted and it is suggested that these varieties are very probably closely related, any distinctive characters having been acquired as a result of ecological and geographical influences.

459. EICHHORN, A. 634.651:576.312.35
Étude caryologique du Carica Papaya. (Karyological study of C. Papaya).
 Cytologia, Tokyo 1937 : Fujii Jubilee Vol. : 447-48.

A study of the behaviour of the nucleolus during mitosis. The somatic chromosome number is 18.

SMALL BUSH FRUITS 634.7

460. KOSTINA, V. N. 634.711:575(47)
(The best raspberry hybrids at the Mleev Experiment Station).
 Plodoovočnoe Khozaistvo (Fruit and Vegetable Growing) 1938 : No. 4 : 62-63.

The aims and methods of raspberry breeding at the Mleev station are outlined and the best hybrids described. The most promising is a hybrid, English x Cuthbert, characterized by vigorous growth, upright shoots, winter-hardiness, excellent yield and large fruits superior to both parents in flavour. Some of the hybrids are early in maturity, others late, thus tending to extend the season. Further crossing with the variety Prussia is being effected to increase the size of fruit.

461. HAHN, G. G. 634.72-2.452-1.521.6:575.11
Blister rust susceptibility studies of naturally pollinated seedlings of the immune Viking currant.
 J. For. 1938 : 36 : 737-47.

The Viking red currant (syn. Rød Hollandsk Druerips) is a Norwegian variety immune to white pine blister rust, *Cronartium ribicola* Fischer. It is probably closely related to or may even be identical with the immune variety, Rote Holländische, of Tubeuf.

The probable parentage of this immune variety is discussed and the possibility of obtaining immune seedlings was tested by growing seed isolated from other varieties and seed from plants which had been exposed to cross-pollination. The seedlings were artificially inoculated. Only a small percentage of the seedlings was susceptible. The results show the dominant character of resistance and indicate that multiple factors are involved in the inheritance.

462. KOSTINA, V. N. 634.725:575(47)
(The hybrid stock of gooseberries at the Mleev Experiment Station).
 Plodoovočnoe Khozaistvo (Fruit and Vegetable Growing) 1938 : No. 4 : 60-62.

On the basis of observations of a large number of crosses, indications are given of the most promising combinations in respect of such qualities as resistance to *Sphaerotheca*—many of the most resistant being hybrids of gooseberry x currant—spinelessness and form of bush. The best hybrids have berries 2-3 times the size of those of the standard variety, Houghton (Khauton), and are described.

463. ŽELEZNIKOVA, V. I. 634.75:575(47)
(New varieties of strawberry at the Mleev Experiment Station).
 Plodoovočnoe Khozaistvo (Fruit and Vegetable Growing) 1938 : No. 4 : 63-64.

The aims and scope of the hybridization work are described, followed by an account of the six best hybrids, all of which have proved superior to the standard varieties.

464. 634.75:575(49.2)
634.0014(49.2)

Verslag van den Proeftuin te Breda over de jaren 1935, 1936 en 1937.
(Report of the Experiment Plot at Breda for the years 1935, 1936
and 1937).

Pp. 16.

This paper, which contains a general report on fruit cultivation, also gives results of pollination investigations with pears and apples.

Strawberry breeding arising out of research on mosaic has been directed in the first instance to ascertaining the degree of homozygosity of various clones for the main genetic factors. The best strains from this standpoint are seedlings obtained from the five following varieties by selfing: Lloyd George (strain 243), Haagsche Bruine (strain H.Br.), Walsenior (strain 112), Hornet (strain 238) and Pyne's Royal (strain 141). These have been studied from the standpoint of heterosis, degeneration due to inbreeding and their improvement as regards the capacity to breed true. Some of the best have been selfed and the seedlings studied.

The application of Mendelian segregation and the uses of inbreeding and hybridization are briefly mentioned and an outline of the present state of the breeding operations in progress with various strains is presented in tabular form, including a table of those breeding true for fruit colour.

465. ALEŠIN, E. I. 634.75:575.114:581.331.2.02
(Notes on breeding technique. II. Observation of segregation of
characters in strawberry hybrids).

Proc. Agric. Inst. Krasnodar 1937 : Issue 9 : 21-32.

Pollen was treated with ether, chloroform, short day conditions, high and low temperature and infra-red rays. Leaf measurements made on the hybrids showed their leaf length to be smaller than that of either of the parents; the length and breadth and leaf index varied in the hybrids from different treatments, the differences being statistically significant. The same was observed in regard to length of petiole. No mutations were observed and the differences caused by the treatment are thought to be brought about entirely by the alteration in the proportion of gametes of the different types that function.

466. Gd. 634.75:575.12
634.75 Bohumir Landovsky
Erdbeere "Bohumir Landovsky". (The Bohumir Landovsky straw-
berry).

Obst- u. Gemüseb. 1937 : 83 : p. 170.

From a cross between Kentish Favourite and Deutsch Evern, the director of the State Research Station for Vegetable Culture at Pruhonice, near Prague, has produced the Bohumir Landovsky variety, named after his son. It is remarkable for its earliness, resistance to diseases, uniformity of the fruits and their shape, colour, delicious flavour and high commercial value.

467. ROCKHILL, H. 634.75:575.242
Mutations and reversions in the strawberry.

Trans. Ia Hort. Soc. 1937 : 72 : 134-38.

Cases of mutation to the ever-bearing habit and back to normal are recorded, together with some related, unexplained phenomena.

468. SCHIEMANN, E. 634.75:577.8:575
Geschlechtsvererbung bei Fragaria. (The inheritance of sex in
Fragaria).

Ber. Dtsch. Bot. Ges. 1938 : 56 : 161-62.

A report of a lecture in which a review is given of the examples of the "mechanical sex" ratio of 1 : 1 in dioecious strawberries. By crosses between the dioecious *F. elatior* and hermaphrodite diploid species (*elatior* x *collina* and *elatior* x *nipponica*) fertile tetraploid hybrids have been produced and their segregation for sex has been studied.

The St. Valery type is therefore dominant, *DDNNPP*, the "Duwicker" *ddNNPP*, the Nantes *ddnnPP* and Parisian *ddNNpp*.

The most valuable horticultural varieties are the Parisian and the Nantes and the author's results show that only selection methods can be used for the improvement of these types.

504.

TATEBE, T.
[*Karyological studies on the Japanese radish. (Raphanus sativus var. macropodus (Lév.) Makino)*].

Bot. & Zool. 1936 : 4 : 1893-900.

The haploid chromosome number is 9. The diploid number 18 was also observed in one variety.

At meiotic metaphase the bivalents are usually arranged with 2 in the centre and 7 at the edge of the plate, though the 1-8 arrangement also occurs in 29 per cent of cases. Associations of four and six chromosomes were observed at diakinesis, but from the beginning of metaphase only bivalents were present, and there were no further irregularities. The cause of this phenomenon of association is not clear.

505.

TATEBE, T.
[*Studies on old flower pollination in the Japanese radish. (A preliminary note)*].

Bot. & Zool. 1937 : 5 : 599-602.

Selfing of self-incompatible individuals of the Japanese radish (*Raphanus sativus* var. *macropodus*) was found to give higher seed production when performed two or three days after the opening of the flowers than when done immediately on opening. This agrees with similar results obtained for various *Brassica* forms.

506.

TATEBE, T.
[*Studies on self-compatibility in the Japanese radish. (Raphanus sativus var. macropodus (Lév.) Makino)*].

J. Hort. Ass. Japan 1936 : 7 : 381-92.

The degree of self-fertility was found to cover a very wide range from complete self-incompatibility to complete self-compatibility. The self-compatible plants were selfed and tested for self-fertility in subsequent generations. They appear to segregate self-compatible and incompatible individuals.

Selfing by three different methods was attempted (a) bagging without artificial pollination, (b) pollination within the same flower and (c) pollination between different flowers on the same plant. The first method gave rather lower fertility than the other two, but no difference was perceptible between (b) and (c).

Artificial cross-pollination gave 80-90 per cent of normal pods, and natural open pollination gave about 70 per cent.

507.

TATEBE, T.
(Bud-pollination in the Japanese radish).

Agric. & Hort. Japan 1937 : 12 : 839-44.

In the Japanese radish, self-pollination of young buds of self-incompatible flowers resulted in a higher set of seed than was obtained when self-pollination was effected after opening.

The rate of pollen-tube growth through the stylar tissue is greater in the case of bud-pollination, and it is suggested that the special inhibitory substance which retards the growth of pollen tubes of the same line in the open flower is not developed until after the early bud stage.

The self-fertilized seeds obtained by bud-pollination germinate quite as well as cross-fertilized seeds.

635.15:576.354.4

635.15:576.312.35

635.15:581.162.5:581.162.31

635.15:581.162.5:581.162.31

635.15:581.162.5:581.162.31

508. WINTER, L. 635.24:575.257
 Variations intéressantes de topinambours greffés du Professeur Lucien Daniel. (**Interesting variations in artichokes grafted by Professor Lucien Daniel**).
 Rev. Hort., Paris 1937 : 109 : 658–60.
 Some of the various forms grown from seed of *Helianthus tuberosus* grafted on *Helianthus annuus* are briefly described and illustrated. (Cf. also "Plant Breeding Abstracts", Vol. VII, Abst. 799).
509. TROFIMETS, N. Kh. 635.25:537.531
 (**X-ray irradiation of onion**).
 Itogi Rabot po Seleksii Ovščnykh Kul'tur Gribovskoi Stantsii (Summary on vegetable breeding of the Gribovo Station No. 1).
 Sel'khozgiz, Moscow 1935 : 259–64.
 X-ray irradiations of the plant caused a reduction in root growth and in most dosages also of leaf and stem growth, though in certain dosages this was increased. Various floral abnormalities also occurred. Similar effects were observed when the bulb was irradiated. Treatment of dry seed led to the production of plants with white patches, irregular development and various other growth anomalies, including frequent failure to flower. Treated plants showed a slight thickening and shortening of the chromosomes.
510. ORDYNISKII, V. V. 635.25:575(47)
 (**Breeding the "Arzamas" onion**).
 Itogi Rabot po Seleksii Ovoščnykh Kul'tur Gribovskoi Stantsii (Summary on vegetable breeding of the Gribovo Station No. 1).
 Sel'khozgiz, Moscow 1935 : 196–227.
 A series of detailed observations showed that the type of bulb used for planting greatly influenced the type of onion produced. Various positive correlations, such as number of branches with number of daughter bulbs, uniformity of ripeness with size of bulb, weight of bulb with diameter, yield with number of daughter bulbs, were observed, together with a negative correlation between size and number of daughter bulbs.
 In selection it is recommended therefore that the choice be given to forms with wide, flattened bulbs, forming about three daughter bulbs of uniform size, except when breeding for reduced branching, where single bulbed forms should be selected; pinkish yellow colour, resistance to *Botrytis allii*, good keeping capacity and early ripeness for market are also desirable features in selecting. Forms that flower when grown from bulbs and that do not flower when grown from seed should all be discarded. Directions for carrying out the breeding work are given.
511. ORDYNISKII, V. V. 635.25:575(47)
 (**Breeding the "Pogara" onion**).
 Itogi Rabot po Seleksii Ovoščnykh Kul'tur Gribovskoi Stantsii (Summary on vegetable breeding of the Gribovo Station No. 1).
 Sel'khozgiz, Moscow 1935 : 246–58.
 The characteristics of the Pogara onion are described. Selection is carried out by choosing the forms with 3–4 large and uniform daughter bulbs, free from disease and pigmentation.
512. ORDYNISKII, V. V. 635.25:575(47)
 (**Breeding the "Rostov" onion**).
 Itogi Rabot po Seleksii Ovoščnykh Kul'tur Gribovskoi Stantsii (Summary on vegetable breeding of the Gribovo Station No. 1).
 Sel'khozgiz, Moscow 1935 : 228–45.
 The influence of different size, age and type of sets on the form and yield of the resulting crop has been studied. Selection in two directions is being practised: (a) for a type that is grown from sets for two successive years only, in which case forms producing only three to four daughter bulbs of equal size are selected and (b) for a type that is grown for three successive

years from sets, in which case a type is selected that produces in the second year a large number (5-7) of daughter bulbs.

At the same time forms with pigmented scales, disease or cracks are discarded; high yield is aimed at by combining size and number of bulbs, and earliness by selecting only those bulbs that are completely ripe for market at harvesting.

513. EMSWELLER, S. L. and 635.25:575.127.2:576.354.4:575.116.1
JONES, H. A.
Crossing-over, fragmentation, and formation of new chromosomes in an *Allium* species hybrid.
Bot. Gaz. 1938 : 99 : 729-72.

Inter alia, morphologically new types of chromosomes were observed in the first pollen grain divisions in the hybrid between *A. cepa* L. (yellow Globe Danvers) and *A. fistulosum* L. These have been produced by crossing-over between the two genomes. The cytological evidence therefore indicates that it should be possible to transfer the resistance to onion smut (*Urocystis cepulae* Frost), pink root (*Phoma terrestris* Hansen) and thrips (*Thrips tabaci* Lind.) of *A. fistulosum* to *A. cepa*.

514. TIMOFEEV, N. N. 635.25:581.44:575
(Branching in onions and its importance in determining the commercial qualities).
Itogi Rabot po Seleksii Ovoščnykh Kul'tur Gribovskoi Stantsii (Summary on vegetable breeding of the Gribovo Station No. 1).
Sel'khozgiz, Moscow 1935 : 161-95.

An examination was made of a large collection of onion varieties, they were found to differ greatly in their degree of branching; the different types are described.

The highly branched types were found to be more rapid in general development and seem to be physiologically different. Their bulbs contain a larger number of branch initials and are consequently thicker. They contain also a larger number of daughter bulbs and tend to separate into their component parts and so are often deformed; these types can often be recognized by the lowness of their first branching node, since this node is consistently lower in the more branched types. The form of the daughter bulbs also varies according to the variety and the number and thickness of the scales decreases with the rise in their number. The much branched forms are also found to be more pungent. In breeding it is thus clear that this type should be avoided.

Forms producing a large number of leaves before flowering are cultivated for salad purposes; in this case the more branched forms are preferable. Also in keeping capacity the branched forms are superior.

The position of the first branching node (and hence the degree of branching) has been observed to be transmitted fairly constantly in selfed progenies.

515. FEDOROV, G. V. 635.25-2.111-1.521.6:575.127.2
(Frost resistant forms of onion for the north).
Plodoovoščnoe Khozaistvo (Fruit and Vegetable growing) 1938 : No. 8-9 : p. 35.

The common onion (*Allium cepa*), which is not hardy, was crossed with two frost-resistant species, *A. altaicum* and a species referred to as Batun. The hybrids were intermediate in type but displayed marked heterosis. Most of the plants in the second year produced a number of small bulbs but 21 remained undivided like the *Allium cepa* parent. Others had a large head of excellent quality and flavour and are of practical interest from this point of view too.

516. KRIVENKO, A. A. 635.262:576.312
A cytological study of garlic (*Allium sativum* L.).
Biologičeskii Žurnal (Biologicheskij Zhurnal) 1938 : 7 : 47-68.

Chromosome studies were made on 16 different races of garlic, in all of which the somatic

number was 16. Data are given on the length and breadth of the chromosomes and of their individual arms, with illustrations of the idiograms, revealing considerable variation in the dimensions of the arms and in the ratio of the long to the short arm. The correlation between size of cell and size of chromosomes was low. Four chromosomes with secondary constrictions were present and the number of nucleoli varied between one and five. The species is compared with 39 other species of *Allium* and is found, together with certain other species, to constitute a distinct group as regards karyotype.

Meiosis in pollen and embryo-sac formation was quite regular in most forms, apart from occasional delays in separation of certain pairs; tetrad formation was also in most cases regular. The later development of both pollen and embryo-sac displayed, however, abnormalities of varying degrees in different years and the plants were almost entirely sterile. Under specially favourable conditions of environment it was found possible to obtain a few seeds.

517. KOPETZ, L. M. 635.34:519.241.1:575.42
 Korrelative Wechselbeziehungen bei Dauerweisskohl. Ein Beitrag zur Systematik der Auslese. (**Correlations in white cabbage for storing. A contribution to methods of selection.**)
 Züchter 1938 : 8 : 213-16.

Analytical investigation on the heads of a variety of white cabbage for storage purposes showed definite correlations between the internal structure of the head and the length and shape of the stem.

518. KHIMIČ, P. E. 635.34:575.125
 (**Heterosis in cabbage.**)
 Itogi Rabot po Selektcii Ovoščnykh Kul'tur Gribovskoi Stantsii (Summary on vegetable breeding of the Gribovo Station No. 1).
 Sel'khozgiz, Moscow 1935 : 63-72.

Hybrids were obtained by planting two varieties alternately in each row, in such a way that each plant of one variety was surrounded by four of the other. Artificial crosses were also made and confirmed the results, which were as follows:—

The hybrid No. 1 x Valvatevka was nearly twice the size of the parents and the head exceptionally large, nearly twice the weight of that of No. 1 and maturing equally early; it was somewhat less compact. The rate of growth was distinctly higher than in the parents. The reciprocal hybrid closely resembled Valvatevka and did not differ from the parents in rate of growth but was two days earlier in maturity.

The hybrid from the cross Braunschweig x Amager, resembles the maternal parent but is six days later in maturity; it exceeds it by 60 per cent in yield and exceeds the average of the two parents by 30 per cent. The reciprocal exceeded the average yield of the parents by 100 per cent and exceeded the direct hybrid in rate of growth; its head was very compact and of excellent quality and colour.

The hybrid Glory of Enkhuizen x Saburovka resembled the maternal parent, but approached the male parent in yield and exceeded both in rate of growth and earliness. The reciprocal resembled Saburovka in vigour but gave large, round, white heads of the paternal type, which it exceeded in yield; its rate of growth was higher than the direct cross.

The hybrid Glory of Enkhuizen x Valvatevka was more vigorous than the parents and earlier in maturity, more compact and higher in yield. The reciprocal was still earlier and exceeded both parents in yield.

The author concludes that the degree of heterosis increases with the difference between the two parents in form of head and particularly in time of maturity.

519. U, N., 635.34:575.127:633.853.48:576.354.4
 NAGAMATU, T. and
 MIDUSIMA, U.
 A report on meiosis in the two hybrids, *Brassica alba* Rabh. ♀ x
B. oleracea L. ♂ and *Eruca sativa* Lam. ♀ x *B. oleracea* L. ♂
 Cytologia, Tokyo 1937 : Fujii Jubilee Vol. : 437-41.

The F₁ hybrids *Brassica alba* x *B. oleracea* and *Eruca sativa* x *B. oleracea* were both completely sterile. In the former, 21 univalents were found at meiosis, with no bivalents. A small

number of restitution nuclei were found. The pollen was largely sterile, but a few grains were large and perfect.

In the second hybrid, there were 0-3 bivalents and 14-20 univalents at meiosis. The divisions were extremely irregular, and the anthers were frequently empty.

520. POPOVA, E. M. 635.34:575.42(47)

(**The influence of selection on varieties of white-headed cabbage**).

Itogi Rabot po Seleksii Ovoščnykh Kul'tur Gribovskoi Stantsii (Summary on vegetable breeding of the Gribovo Station No. 1).

Sel'khozgiz, Moscow 1935 : 43-62.

Repeated mother plant selection resulted in marked improvement in earliness and uniformity of maturity, in roundness, uniformity and firmness of head, and in reduction in stalk (linked with round head). Improvement in yield was also evident, though early varieties invariably yielded less than late varieties. Brief descriptions are furnished of the most successful of the improved varieties.

521. CATCHESIDE, D. G. 635.34:576.312.38

Secondary pairing in *Brassica oleracea*.

Cytologia, Tokyo 1937 : Fujii Jubilee Vol. : 366-78.

Observations of secondary pairing at meiosis in *Brassica oleracea* suggest that it is a secondary polyploid with a basic chromosome number of six. Three of the six basic chromosomes are present in duplicate, and the other three only once each. Higher associations were observed in some cases, and the author concludes that these are due to structural changes, especially reduplications.

Secondary association of bivalents occurs only at Metaphases I and II. It is absent at diakinesis, when the bivalents are equally spaced peripherally in the nucleus and so arranged that each normally has five neighbours and three non-neighbours.

Statistical analysis of the relative frequencies of the various normal associations shows that two similar bivalents have a mean chance of 0.5923 ± 0.0129 of pairing secondarily. This agrees well with the chance, 0.625, that a particular bivalent will lie adjacent to the other similar bivalent at diakinesis, and suggests that secondary pairing will occur whenever two similar bivalents are neighbours at that stage. A similar relationship exists between the arrangement of the chromosomes at interkinesis and secondary pairing at Metaphase II. There is a significant correlation between the type of secondary pairing in the two Metaphase II plates of a pollen mother-cell.

522. TIMOFEEV, N. N. 635.34:581.143.32:575.42

(**The connexion between phyllotaxis and commercial qualities of the head in white-headed cabbage**).

Itogi Rabot po Seleksii Ovoščnykh Kul'tur Gribovskoi Stantsii (Summary on vegetable breeding of the Gribovo Station No. 1).

Sel'khozgiz, Moscow 1935 : 73-81.

A $\frac{2}{3}$ phyllotaxis is normal in cabbage but plants with abnormal phyllotaxis occur in varying proportions in different varieties, being most frequently associated with fasciation. Most of the varieties with a high proportion of such plants proved to have denser and heavier heads, which were rounder and contained a larger number of leaves in cross-section. The character therefore has a positive value in selection and has the advantage that it is detectable at a very early stage in growth.

523. BELOROSSOVA, N. V. 635.35:575(47)

(**Breeding cauliflower**).

Itogi Rabot po Seleksii Ovoščnykh Kul'tur Gribovskoi Stantsii (Summary on vegetable breeding of the Gribovo Station No. 1).

Sel'khozgiz, Moscow 1935 : 82-99.

Observations on a number of seedlings of the variety Haag showed that the forms with the best heads produced the smallest number of seeds. Selection produced in the progeny a material improvement in earliness and uniformity of maturity, and in compactness, whiteness,

form, diameter and keeping capacity. The best families were chosen as élites and enclosed in isolators where artificial interpollination of different plants of one family was carried out. Very few seeds were obtained from this or from artificial cross-pollination. Isolation by interplanting another variety, Kaiser, proved more efficacious. Breeding can only be effective with forms that flower sufficiently early to produce seed, and selection for early seeding has also been performed.

524. THOMPSON, R. C. 635.52:575.11

Genetic relations of some color factors in lettuce.

Tech. Bull. U.S. Dep. Agric. 1938 : No. 620 : Pp. 38.

The establishment of dominant marker genes which have visible effects early in the life of the plant is of great practical importance in lettuce. No reliable method of emasculation exists, and therefore it is important to be able to distinguish hybrids from selfs.

Two basic complementary factors, *C* and *T* are necessary for anthocyanin production. With these genes present, a multiple allelomorphic series *Rr'r* governs the type of pigmentation in the leaves. The *R* and *C* loci are linked, with 36 per cent of recombination.

Dark green leaves (*G*) are dominant to yellow-green (*g*), and black seed (*W*) to white (*w*), a single factor pair being concerned in each case. A chlorophyll deficiency giving green, blotched and albino plants was inherited maternally.

525. SCHULTZ, H. and RÖDER, K. 635.52-2.411.4-1.521.6:575

Die Anfälligkeit verschiedener Varietäten und Sorten von Salat (*Lactuca sativa* L. und *Lactuca scariola* L.) gegen den Falschen Meltau (*Bremia lactucae* Regel). [The susceptibility of various varieties and kinds of lettuce (*L. sativa* L. and *L. scariola* L.) to mildew (*B. lactucae* Regel)].

Züchter 1938 : 10 : 185-94.

Three years' experiments with kinds of *L. sativa* var. *capitata* showed that under natural conditions of infection there was great variation in the degree of resistance but strains with satisfactory resistance were found in all classes, only the conditions for the testing of the winter strains are not considered conclusive. Other varieties of *L. sativa* investigated were var. *secalina*, var. *aurescens* and var. *longifolia* as well as *L. scariola* and f. *integrifolia* and some primitive forms brought back by the Hindu-Kush Expedition. The results are given in tabular form. Temperature and atmospheric moisture are important factors for infection and the development of the fungus. The results of artificial infection with two strains of the fungus showed that the older plants behaved much the same as under natural conditions but the attack was greater; the younger plants were considerably more susceptible. There was a marked difference between the virulence of the two races of the fungus on individual varieties.

Selection for resistance is in progress.

526. REICHELT, K. 635.53:575(43)

635.53 Magdeburger Markt

Sellerie "Magdeburger Markt". (Magdeburger Markt celery).

Obst- u. Gemüseb. 1937 : 83 : p. 41.

This variety, the origin of which cannot now be definitely ascertained, is regarded as a probable mutation from the variety Erfurter. Since its appearance in the trade in 1924 a uniform type has been evolved by careful breeding. It is relatively resistant to disease and is recommended as an excellent variety for market and for canning.

527. LESAGE, P. 635.563:575.31"793"

Suite des recherches sur l'hérédité du caractère physiologique acquis : la précocité. (Continuation of researches on the inheritance of the acquired physiological character : earliness).

C.R. Acad. Sci. Paris 1938 : 207 : 741-43.

The results of growing strains of *Lepidium sativum* under different conditions of temperature

are briefly recapitulated (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 803) and new results obtained with a strain of dwarf peas, Merveille d'Amérique, are noted.

528.

ARASSIMOVICH, V. V.

635.61:575.127.2:581.192

635.615:575.127.2:581.192

(Laws governing the inheritance of chemical character in *Cucurbitaceae* with respect to selection aiming at improved chemical composition).

Bull. Acad. Sci. U.R.S.S., Sér. Biol. 1937 : 1835-51.

In crossings of melons and water melons the F_1 was usually intermediate in respect of sugar content, though sometimes heterosis occurred. Transgressive segregation occurred in the F_2 , the majority of segregates, however, being again intermediate.

All possible combinations of glucose, fructose and sucrose occurred in the segregates and the three sugars appeared to be inherited independently. One plant of the F_2 Tarra x Banana contained eight per cent sucrose, which was much in excess of the higher parent. In certain water melon crossings segregates occurred in which the sugar was almost exclusively fructose, others in which glucose was the main component. Cyclic crossing has shown a great variation in the results of different parental combinations. Sometimes the sugar content of the F_1 was less than either parent and varieties that with one form give very sugary hybrids may with another form give hybrids with comparatively low sugar; certain parents, such as the bush melon Tokhmi, though low in sugar content, tended to give a relatively high proportion of offspring with high sugar (especially sucrose) content, some of its segregates with the high sugar melon, Uč-kzyl, surpassing even this latter in sugar content. Sugar content was inherited independently of the bush habit and the two can apparently be combined.

Water melon crossings involving the early variety, Tulun, which is of low sugar content, give promise of combining the earliness of this variety with the sugar content of others.

Pectin content in the F_1 hybrids usually exceeded that of the parents and cellulose content was the same. Protein content was sometimes intermediate, sometimes above and sometimes below both parents. These different components were inherited independently.

In dessert forms the sugar content rises rapidly towards maturity whereas in wild forms this rise is not apparent and the tendency usually is for the sugar content to fall. In hybrids of the water melon with the wild *C. colocynthis* the fall at maturity characteristic of the latter species was dominant, the actual sugar content being intermediate. Interspecific melon hybrids (with *C. microcarpus*) were all intermediate in sugar content and both parental types were recovered in the F_2 . Crossings of the melon Amery with the wild *C. agrestis* produced an F_1 with more sugar than the dessert parent and an F_2 with a predominance of forms with high sugar and sucrose, many in excess of the dessert parent. Acidity, characteristic of *C. agrestis*, was inherited independently of sugar.

Fodder water melons crossed with dessert species gave intermediate hybrids approaching more to the fodder type in respect of sugars, hemicelluloses, cellulose proteins and salts, all of which were inherited independently. Certain F_1 plants showed a marked reduction in protein content others an increase. The bitterness of *C. colocynthis* was also inherited independently of sugar in crossings with dessert water melons. This was confirmed by a bitter mutant of water melon, in which the sugars were found to be present in the same amounts and proportions as in the unmutated original; on crossing this mutant with a common dessert water melon the sugar content of the latter and the bitterness of the former were dominant and independent segregation occurred in the F_2 .

529.

JAGGER, I. C.,

WHITAKER, T. W. and

635.611-2.42-1.521.6:575.11

PORTER, D. R.

632.42:576.16:635.611

Inheritance in *Cucumis melo* of resistance to powdery mildew (*Erysiphe cichoracearum*).

Phytopathology 1938 : 28 : p. 671. (Abst.).

The resistance of the powdery mildew resistant cantaloupe No. 45 is shown to be due to a single dominant factor (Cf. also "Plant Breeding Abstracts", Vol. VIII, Abst. 279).

In 1938 a new physiological form of the mildew appeared in the Imperial Valley of California and the above variety shows considerable susceptibility to it. No data are available on resistance to this new form.

530. DANA, B. F. 635.62-2.8-1.521.6:575
Resistance and susceptibility to curly top in varieties of squash,
Cucurbita maxima.

Phytopathology 1938 : 28 : 649-56.

Of numerous varieties tested, Yakima Marblehead from Washington and Umatilla Marblehead from Oregon were the only resistant varieties. They combine satisfactory quality and vigour with high resistance to infection by the virus. The strains tested were not uniform for resistance and inbred lines have shown varying degrees of resistance. These inbred lines are being used in the breeding of different types of resistant squashes and also in studies of the nature and behaviour of resistance to the curly-top virus.

531. JAKIMOVICH, A. D. 635.63:575.14
(Inbreeding cucumbers). 635.63:575.114

Itogi Rabot po Seleksii Ovoščnykh Kul'tur Gribovskoi Stantsii (Summary on vegetable breeding of the Gribovo Station No. 1).

Sel'khozgiz, Moscow 1935 : 134-60.

The average set by self-pollination varied from 28.9 to 37.5 per cent in different years, some varieties giving very much more than others; e.g. a set of 75 per cent was obtained in one variety and only 8.3 per cent in another. The number of seeds per fruit was invariably less than by open pollination. Somewhat better results still were obtained in a second inbred generation but a third generation of inbreeding was not quite so good; in the third generation still clearer differences between the varieties were detectable, some such as Schwanenhals and Berlizovskii reacting much more favourably than others. Different lines within the varieties also behaved differently. Late varieties generally gave a better set than early, and varieties with large fruits seemed to be better than those with small fruits.

A certain loss of vigour was detectable in some of the inbred progenies, while others were as vigorous as the parents or even more so. Segregation also occurred in some of the progenies; simple fruit pubescence was invariably constant in inheritance, complex pubescence often gave segregation approximating to 3 : 1 in the inbred progeny. White pubescence was constant too, black pubescence segregated in ratios of approximately 3 : 1. Segregation occurred in the progeny of the variety Japanese Climbing, line 77, for vigour of the secondary and tertiary runners, which largely controls the yield of fruit; some segregates were much more vigorous than the parent line. Promising new types appeared as segregates from some of the other varieties, etc. There was a suggestion that some segregates were more wilt resistant. The inbred progeny of *Cucumis sativus* No. 101 contained a certain number of plants bearing only female flowers, and the variety Cornichon de Paris produced 12 plants with hermaphrodite flowers in a progeny of 31 plants; these flowers, however, were all sterile when selfed. Hermaphrodite varieties gave rise when open-pollinated both to hermaphrodite plants and plants bearing unisexual flowers but attempts to self hermaphrodite flowers led in the majority of cases to the production of parthenocarpic fruits.

532. JAKIMOVICH, A. D. 635.63:581.162
[The floral biology of the cucumber (*Cucumis sativus*)].
 Itogi Rabot po Seleksii Ovoščnykh Kul'tur Gribovskoi Stantsii (Summary on vegetable breeding of the Gribovo Station No. 1).

Sel'khozgiz, Moscow 1935 : 118-33.

Detailed descriptions are given of the floral biology, of the floral types, the observed ratios of male and female flowers in different types, the amount of shedding and of parthenocarpy in different forms and the occurrence of hermaphrodite flowers in certain varieties.

533. FISCHER, A. 635.64:575
Die Wildarten der Tomate (*Lycopersicum esculentum* Mill.) in ihrer Bedeutung für die Züchtung frühereifer, krankheitsresistenter, lagerfester und wohlschmeckender Sorten. [The wild species of tomato (*L. esculentum* Mill.) as regards their importance for the breeding of early, disease resistant, fine flavoured varieties with good storage properties].

Züchter 1937 : 9 : 231-38.

A review of the literature dealing with the improvement of the tomato by crossing with the wild species *L. racemigerum*, *L. racemiflorum*, *L. pimpinellifolium*, *L. cerasiforme*, *L. piriforme*, *L. Humboldtii* and *L. pruniforme*.

534. REINHOLD, J. 635.64:575
Zur Sortenfrage in der Tomatentreiberei, (On the problem of varieties in tomato culture).
Obst- u. Gemüseb. 1938 : 84 : 128-31.

Tomato varieties for forcing should be of a different type from those grown in the open and should be raised mainly under glass. The number of such greenhouse varieties is inadequate and should be temporarily supplemented by the application of systematic selection under glass by the individual grower.

Numerous English, German and American varieties are described with notes on their origin, disease resistance and suitability for greenhouse cultivation.

535. BATRAKOV, M. A. 635.64:575.125
(Cultivation of tomatoes from seeds displaying heterosis).
Plodoovočnoe Khoziastvo (Fruit and Vegetable Growing) 1938 : No. 5 : p. 53.

Double stemmed forms gave higher yields of fruit, which was also earlier in maturity, though the individual fruits were smaller.

Crossed seed from the varieties Sparks x Ficarazzi and the reciprocal gave 26 per cent greater yield of earlier maturing fruits, which, however, again were smaller and also inferior to the Sparks parent in flavour.

536. TOTMAKOV, G. V. and 635.64:575.125
ALPAT'EV, A. V.
(Heterosis in tomatoes).
Itogi Rabot po Selektii Ovoščnykh Kul'tur Gribovskoi Stantsii (Summary on vegetable breeding of the Gribovo Station No. 1).
Sel'khozgiz, Moscow 1935 : 100-17.

Tomatoes of the type bearing very much branched bunches consisting of large numbers of small fruits were crossed in 1930 with a number of other varieties. Varieties representing the first type were Buka, Napoleon's Cluster and Italian Wonder, all late in maturity. All their hybrids displayed heterosis; in crosses with small fruited varieties such as the Currant tomato, the hybrids were 1½ times larger than the parents or more; in yield of fruit, however, they did not surpass the higher parent. Hybrids with commercial varieties such as Danish Export, Pieretta, etc., showed marked increases also in yield and were equal, sometimes superior in flavour to their parents.

Further crosses were effected in 1932, substituting for the variety Italian Wonder, which had given the least success, Borghese, another variety of the same type. The tabulated results show that in 27 out of 36 combinations the hybrid plants exceeded both parents in height, in seven they were intermediate and in one (Japanese Giant x Buka) the F_1 was smaller. The hybrids showed an excess of yield in 32 combinations, in three they were intermediate and in one below both parents; in the cross Bison x Napoleon's Cluster the yield was 77 per cent above that of the higher parent, in Bonny Best x Borghese 84 per cent and in Bison x Borghese 65 per cent. The proportion of diseased and cracked fruits was also lower in the hybrids, except in the crosses with Buka. In 16 crosses the hybrid was earlier than

both parents, in the rest intermediate with a greater approximation to the earlier parent. The fruits of the best combinations were frequently of unsatisfactory flavour but in some cases were superior, e.g. in the crosses Burbank, Norton's Improved Danish Export with Napoleon's Cluster.

The results of all the crosses showed those with Borghese to be better than those with the other varieties of that type as regards degree of heterosis. Heterosis was more pronounced according as the varieties crossed differed in morphological features—e.g. number of locules, complexity of inflorescence, type of fruit, fasciation, etc., and in time of maturity. Where reciprocal crosses were examined they differed little in vigour but certain definite differences in yield were noted.

The best combinations were carried out again in 1933 and this time crosses of *Lycopersicum esculentum* with *L. cerasiforme* and *L. pyriforme* were also included, 93 combinations in all being made. The average yield of the parents was 400–500 grm. per plant, while many of the hybrids gave twice this yield. The best crosses in respect of yield and flavour were Pervaja Khatva x Sparks Gribovskii, Matador Fasciated x Sparks, Marinada Fasciated x Sparks Gribovskii and Sparks x Humbert. The hybrids suffered less from diseases of the whole plant and especially of the fruit and very few of the hybrid fruits split. The hybrids usually approximated to the earlier parent in time of maturity and some were even earlier. The size of seed was increased by hybridization in a great number of crosses. Indications are given of the behaviour of a number of characters as regards dominance.

537. LESLEY, M. M. 635.64:576.312.34:576.312.315
The relation between satellite size and nucleolus size in three races of *Solanum lycopersicum*.
 Genetics 1938 : 23 : 485–93.

In addition to the two types of A chromosome previously recognized (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 665) with short and long satellites respectively, a third type has been discovered with a very long satellite. This type of chromosome is associated with the nucleolus at two points, while the short and long satellite types are each associated at only one point. Increase in satellite size from short to long and from long to very long is accompanied in each case by an increase in nucleolar size.

There is no relation between chromosome size and external plant characters, fruitfulness or pollen abortion.

538. SVESHNIKOVA, I. 635.651:576.356.5:581.143.26:576.16
(Some aspects of morphogenesis in perennial forms of *Vicia*).
 Biologičeskii Žurnal (Biologicheskij Zhurnal) 1937 : 6 : 949–70.

Three races of *Vicia Cracca* exist: a diploid, race A ($2n = 14$), a tetraploid race ($2n = 28$) and race B ($2n = 12$). The chromosome pairs in race A and in race B are identical except for one large double chromosome in race B which is equal in length to two small chromosomes in race A. The two races differ morphologically only in the degree of expression of certain characters, a difference connected mainly with the more delicate habit and etiolated appearance found in the 12-chromosome race which, even though found near Moscow, cannot withstand severe winters, though in Japan it is widespread. The author believes that race B has been derived from race A by translocation as a result of which two chromosomes of race A have come to form one large chromosome in race B, with accompanying elimination (as in *Drosophila*) not only of "inert" portions of chromosome but possibly also of genes, resulting in an etiolated appearance and a great reduction in vegetative growth, flowering, fruiting and resistance to frost. Furthermore, most authors regard the chromosome complex of race B as of secondary origin.

In discussing the importance of the perennial forms of *Vicia* in the evolution of the genus emphasis is laid on their significance as a source of polyploids, which do not occur among the annual forms. It is suggested that the predominance of tetraploidy in the author's material, which was obtained from a northerly region, is due to the effects of frosts.

In analysing the reduction division in autopolyploid *V. Cracca*, the high number of quadrivalents observed is regarded as an indication of the comparatively recent origin of the polyploid from the diploid.

Morphologically the 28 and the 14-chromosome races differed only slightly. The autopolyploid sets fewer seeds than the diploid but surpassed it in the 3rd and 4th year in vegetative vigour, the diploid scarcely flowering at all in the 4th year when it died out—a result which explains how in nature the autopolyploids, and especially the perennial forms can oust the diploids in spite of the regularity in gamete formation and greater fertility of the latter.

The incidence of perennials in the Russian flora is considered with its relation to polyploidy, as well as the actual or potential function of the perennial habit in maintaining semi-sterile types for a period during which they may pass through the transition stages of eliminating quadrivalent formation in favour of regular bivalent formation. A practical application of this theory to experimentally induced mutation is suggested.

Having discussed the relation between the perennial and annual habit in connexion with the preservation of dominant and recessive mutations, the author submits that the autopolyploid may be regarded as a new species in which dominant mutations of definite evolutionary importance will tend to predominate.

539. ZAUMAYER, W. J. 635.652:575.11.061.633
A heritable abnormality of beans resembling mosaic.

Phytopathology 1938 : 28 : 520-22. (Abst.).

In the F₂ of crosses in which Corbett Refugee was used as one parent variegated types occurred giving ratios of 15 green: 1 variegated. The expression of variegation varied considerably in degree and not all plants of the Corbett Refugee variety produced these types in F₂, the variety being apparently a mixture. Though the ratios obtained in F₂ plants supported the hypothesis of duplicate factors suggested by the F₂ segregation, the variegated F₂ plants did not breed true. No explanation can at present be offered for this behaviour and further studies are in progress.

540. OGAN'JAN, V. N. 635.655:581.162.3:578.08
(Method of crossing the soya bean). 635.655:575.11
 Seleksija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 1 : 31-35.

The introductory part of this paper deals with the factors affecting the viability of the pollen, i.e. plant metabolism, water supply and temperature, atmospheric humidity and light. The author then presents data on microscopic investigations on the time of maturity and dehiscence of the anthers, of germination of the pollen tubes and on the period of receptivity of the stigma. The methods used are described.

It is concluded that the most favourable stage for emasculation in the soya bean is when the anthers are mature but have not yet dehisced; buds should be operated on when the corolla is scarcely visible within the sepals. The germination of the pollen and the growth of the pollen tubes takes about one hour. The pollen is viable for 24 hours. The highest percentages of successes were obtained by pollinating on the day after emasculation but the optimum time for pollination could not be exactly determined. Emasculation and pollination of buds on the same day is attended by the risk of self-fertilization, which may occur even in closed buds. The stigma begins to wilt from 3-5 days after emasculation. Incidentally data on segregation for corolla colour (which gave a 1:2:1 ratio), vegetative period and pubescence have been collected in making the necessary crossings for the pollination experiments.

541. ČVAŠAEV, T. Z. 635.656:575(47)
(Promising varieties of peas and lentils for Western Siberia). 635.658:575(47)
 Seleksija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 3 : 35-38.

Uniformity of ripening, protein content and freedom from pod rotting, from shedding, and from *Aschochyta* are the points to which greatest importance is attached in judging new pea varieties.

In lentils, drought resistance, yield, low temperature requirements, uniformity of ripening early maturity, freedom from shedding, shattering and rust and the protein content are taken into consideration.

The pea variety, Štambovyi II No. 2, obtained by repeated selection from a mixed population of the variety *coronatum*, is particularly promising, and among the lentils encouraging results have been obtained from Frantsuzskaja II No. 5, a form of *Vicia ervilia*.

542. ENIN, T. K. 635.656:575.42

(**A new variety of sugar pea**).

Plodoovoščnoe Khozaistvo (Fruit and Vegetable Growing) 1938 : No. 8-9 : 37-39.

By selection in a mixed population of the variety "Rostov Low Sugary" a strain with improved yield, green seeds and greater uniformity of type was attained.

543. SOLOV'EVA, V. K. 635.656:581.47:575

(**Sugar varieties of pea**).

Itogi Rabot po Seleksii Ovoščnykh Kul'tur Gribovskoi Stantsii (Summary on vegetable breeding of the Gribovo Station No. 1).

Sel'khozgiz, Moscow 1935 : 265-90.

The variety, Konek Gorbunok, a selection from Mammoth having large (edible) sugar pods without parchment in the endocarp but with peas of brownish colour and of slightly inferior flavour was crossed with No. 6 Albanskii, having large peas of the marrowfat type and produced the variety Žegalov's pea, a very tall type with large pods almost free from parchment, and large, wrinkled, green peas. Further selections in the direction of reduced parchment were made but even the lines entirely free produced occasional segregates with inedible pods and also occasional chimaeras.

Žegalov's pea crossed with the variety Neistočimyi produced an F₁ with inedible pods and an F₂ with 41.5 per cent of edible pods; when crossed with another sugar pea, Majak, however, the hybrids were all of the sugar type.

The sugar content in the sugar pods varied from 5 to 8 per cent of the dry weight and the parchment content in the mature pod from 0.5 to 1 per cent of the dry weight.

Other sugar varieties produced by hybridization are G. 195 Neistočimyi, from Mammoth x Thomas Laxton; it is early in maturity, has a sugar content in the pods of 6.4 to 7.6 per cent, is resistant to bacterial disease, and good in yield; and G. 702 Majak, with round seeds, from the cross Konek Gorbunok x Fibreless Sugar; it has large edible pods, large seeds and uniform ripening. These two latter varieties have not given any non-edible segregates.

544. WEIMER, J. L. 635.656-2-1.521.6:575(75.8)

635.656 Austrian Winter

Problems in connection with Austrian Winter field pea breeding for disease resistance.

Proc. 39th Annu. Convent. Ass. S. Agric. Wkrs, Atlanta, Ga 1938 : 58-59.
(Abst.).

An effort is being made to combine the good qualities of the Austrian Winter field pea with resistance to as many diseases as possible. A large number of pea varieties were grown in the field and the best resistant selection crossed with Austrian Winter. The F₁ is being grown.

545. WADE, B. L.,

ZAUMEYER, W. J. and

HARTER, L. L.

635.656-2.484-1.521.6:575.11

Variety studies in relation to *Fusarium* wilt of peas.

Circ. U.S. Dep. Agric. 1938 : No. 473 : Pp. 27.

Resistance to *Fusarium* wilt in peas caused by *F. orthoceras* var. *pisi* is due to a single dominant gene, *Fu*. Only two classes of plant exist, completely immune and susceptible, so that scoring is exceptionally easy.

1,047 strains of peas were tested on wilt-infested soil, and details of their reaction are given. The geographical distribution of susceptible forms is also discussed. The disease has been reported only in the United States, and nearly all the important American varieties are susceptible. Dwarf, early market-garden varieties with short internodes were all completely susceptible, and no useful resistant rogues were found.

546. ORDYNKII, V. V. and FEDORČENKO, A. V. 635.67:575(47)
[**The culinary maize "Pioneer of the North" (KR. 06)**]. Itogi Rabot po Selektii Ovoščnykh Kul'tur Gribovskoi Stantsii (Summary on vegetable breeding of the Gribovo Station No. 1). Sel'khozgiz, Moscow 1935 : 319-27.

The main problem in producing sweet corn suitable for the more northerly parts of the Soviet Union is the selection of early maturing forms. The variety Pioneer of the North, produced by crossing the sweet maize, First of All, with the early variety Squaw, exerted its stigmas after 65 days as compared with 90 days in other sweet varieties such as Golden Bantam and reached full maturity after 4 months in the Moscow region, where most early American varieties never mature at all. When ripe for market the grain contained 10·3-13·6 per cent sugar. Its extensive cultivation is confidently recommended.

547. NEAL, N. P. 635.67:575:578.08
Problems in hybrid sweet corn production in Wisconsin. 635.67.00.14(77.5)
Canner 1936 : 83 : 16, 28.

NEAL, N. P.
Results of 1937 hybrid sweet corn trials in Wisconsin, I, II.
Canner 1937 : 85 : No. 23 : 14-16 ; No. 24 : 18, 20, 22.

NEAL, N. P.
The Wisconsin sweet corn trials 1937.
Canning Tr. 1938 : 60 : 79-82.

In the first of these papers, attention is drawn to the unsatisfactory nature of much of the double-cross and top-cross sweet corn seed available to Wisconsin growers. The conditions which must be observed by seedsmen producing hybrid seed are outlined. The need for adequate isolation of plots is stressed, and it is also pointed out that it is unsatisfactory to save seed from the male parent in the crossing plots as "inbred seed", owing to the impossibility of completely detasseling the female parent.

The later papers describe trials of a number of hybrid sweet corn varieties conducted by the Wisconsin Agricultural Experiment Stations in co-operation with certain commercial firms. A very great difference in value is noted between stocks of the same hybrid variety marketed by different seed firms, many of them being very unsatisfactory.

548. JENKINS, R. R. and SAYRE, C. B. 635.67:575.12:581.192
Chemical studies on the open-pollinated, top-cross, and hybrid inbred strains of yellow sweet corn in relation to the quality of the canned product.

Food Res. 1936 : 1 : 199-216.

Chemical analyses and canning tests were carried out on a number of strains of open-pollinated and hybrid sweet corn. The hybrid strains were found to be superior in quality, and had ears which matured at a slower rate, so enabling harvesting of ears in prime condition to continue over a period nearly twice as long as was the case for the open-pollinated strains.

BOOK REVIEWS

FISHER, R. A.

519.24

Statistical methods for research workers.

Oliver and Boyd, Edinburgh and London 1938 : 7th ed. 15s. 0d.

Pp. xv + 356. 72 tables.

This well-known text-book must be regarded as one of a trilogy, since the sections of chapter VIII, the Principles of Experimentation, were developed three years ago into one independent book, *The Design of Experiments*, while the recent publication of "Statistical Tables", by Fisher and Yates, provides in separate form all the tables of the book under review, together with a number of others, and with illustrations of their use. There are two main changes in the seventh edition. A fuller introduction is given to the theory of orthogonal polynomials, by way of orthogonal comparisons between observations, and reference is made to "Statistical Tables" for tables which facilitate direct arithmetical calculation of the polynomials, up to the fifth degree.

A new section gives an outline of the important new subject of the use of multiple measurements to form the best discriminant functions of which they are capable. This is an application of statistics which will interest the plant breeder, and, indeed, reference is made to its use in plant selection, in an attempt to determine how the different observable characters of plant progenies should be combined in selecting for any particular end. An illustration of the method is furnished, which throws light on the application of the appropriate tests of significance.

The author's characteristic style is apparent in the additions, and the argument, if difficult to grasp at first reading, is very stimulating to the reader's mental processes. J. W.

FISHER, R. A. and

519.24

YATES, F.

Statistical tables for biological, agricultural and medical research.

Oliver and Boyd, London 1938 : 12s. 6d. Pp. viii + 90. 34 tables.

The well-known statistical tables which have appeared in successive editions of the first-named author's book, *Statistical Methods for Research Workers*, form the basis of the present publication, and it is obviously a great convenience to statistical workers generally that the tables to which he must frequently refer should be separately published. But the material has been much expanded by the inclusion of tables from other sources, and by the computation of new tables. Beginning with the normal distribution, areas and ordinates, there are tables for the distributions of t , χ^2 , z and the correlation coefficient, that of z , in particular, is much more extensive than anything hitherto published. A new table enables tests of significance to be carried out for 2×2 contingency tables, and there are a number of tables of probits, which have been found useful in medical research. The first part of the volume concludes with angular transformation tables. Then there are a number of tables useful to the agricultural statistician. The Latin squares of various sizes are enumerated and classified, while there are useful lists of solutions for balanced incomplete blocks. Tables follow of scores for ordinal (or ranked) data; for initial differences of powers of natural numbers; for orthogonal polynomials, and for the calculation of integrals from ordinates. There follow tables of logarithms, including natural logarithms of numbers up to 100, of squares, square roots, reciprocals, factorials and natural sines and tangents. A new set of random numbers is provided, and the final table is a useful one of constants, weights and measures, etc. The value of the book is much enhanced by a detailed introduction which describes and illustrates the use of the various tables.

The diverse character of the tables, which are excellently printed throughout, indicates the catholicity of taste that must characterize the modern statistician's attack on experimental problems, and while the book cannot be regarded as a complete tabular manual for the statistician, it forms a most valuable working compendium for the solution of most practical problems, and is a welcome addition to statistical literature. J. W.

ROEMER, T. and
RUDORF, W. (editors).
Handbuch der Pflanzenzüchtung. (**Manual of plant-breeding**).
Paul Parey, Berlin 1938. Vol. I : Lief. 1-3 : pp. 1-80. 27 figs. ; pp. 81-160.
28-44 figs. ; pp. 161-240. 45-51 figs. 11 tables ; Vol. IV : Lief. 4 : pp. 1-80.
18 figs. RM. 6.50 each part.

575:633

Of these four numbers, the first three represent parts of the first volume of a comprehensive and composite work on plant-breeding and the fourth, on *Beta* is a part of Vol. IV. As neither volume nor even the separate parts are complete it is impossible to give more than a general outline of the whole work.

The whole scheme is to be covered in five volumes. Vol. I is devoted to the general theories of plant breeding, volume two to the breeding of the main cereals, volume three to leguminous forage crops, grasses and *Brassica* forage plants; volume four to potatoes, root-crops, oil and fibre plants and tobacco and the fifth volume to vegetables, fruit and forest trees.

Each section is written by a specialist in the subject and the list of authors is not entirely confined to German men of science as among others, Dr Åkerman of Svalöf is partly responsible for the wheat section and Dr Lamprecht of Weibullsholm has contributed the article on *Brassica* forage plants.

The book is illustrated by numerous excellent photographs, drawings and diagrams.

PLATE, L.
Vererbungslehre mit besonderer Berücksichtigung der Abstammungslehre
und des Menschen. Band. III. Spezielle Genetik einiger Nager. (**Genetics
with special reference to evolutionary theory and man. Vol. III.
The special genetics of some rodents**).

Gustav Fischer, Jena 1938 : Bound RM. 12, Unbound RM. 10. 2nd ed.
Pp. ix + 1233-451. 297 figs.

The first two volumes of the second edition of Plate's text-book have already been reviewed in "Plant Breeding Abstracts" (Cf. Vol. III, p. 79 and Vol. IV, p. 167). The third volume was unfinished at the time of his death in 1937 and the book under review is actually the section on rodents. The animals dealt with are house and field mice, rats, rabbits and guinea-pigs. A bibliography and index are provided and the work is well illustrated and printed. While it is to be regretted that this important work, representing one particular viewpoint in genetics, should be left unfinished, a compilation of the genetics of rodents should be of no little value in view of the important part these small mammals have played in the development of genetical theory.

J. L. F.

SCHULTE, J. E.
Erfelijkhed en eugenetiek. I. Wetenschappelijke grondslagen. (**Inheri-
tance and eugenics. I. The scientific basis**).
De Erven F. Bohn N. V., Haarlem 1938 : Bound F. 7.90, Unbound F. 6.90.
Pp. 435. 90 figs.

575.1

575.191

This is the first volume of a work on heredity and eugenics by a Dutch medical man. His aim has been to present a concise outline of recent developments in the study of inheritance and its applications to man in the existing social framework and thus to provide the reader, be he physician, medical student, social worker, lawyer or educated layman, with the necessary knowledge for a proper estimation of the value of recent discoveries in inheritance and their possible applications in eugenics. More emphasis is therefore admittedly laid (even to some extent in Vol. I), upon data with a bearing on human genetics, though the important findings as regards plants and animals receive due but more concise treatment.

In the first part of Vol. I a critical survey of Mendel's precursors precedes an outline of his life and work and a discussion on variation (both inherited and acquired). Considerations are then presented on the period of rediscovery of the Mendelian laws and their subsequent elaboration leading to the discovery of linkage and sex linkage of factors, cryptomeric and

lethal factors, dominance, etc. A chapter is devoted to the contribution of De Vries and of numerous other workers to the theory of mutation. The relation between the genotype and the phenotype is discussed in the final chapter of this section.

Part II, which is concerned with the explanation of the laws of inheritance, deals with the cytological basis of genetics, reproduction and fertilization, sex determination, normal and aberrant chromosome numbers, chromosome structure and the chromosome theory, mutation and research on its experimental induction, cytoplasmic inheritance, the nature of the gene, and considerations on genetics in relation to evolution.

The volume is completed by subject and author indexes.

The treatment throughout is essentially critical and stimulating and the work contains a wealth of both historical and recent information from varied sources including Dutch, Russian and other foreign literature. In addition the text is accompanied by excellent plates and other illustrations, which together with the copious annotations as well as literary and other quotations indicate the author's wide reading and original approach to his subject.

To biologists who read Dutch and desire more intellectual stimulation than is usually to be found in the mere text-book, the work can be cordially recommended.

ZIMMERMANN, W.

575.321

Vererbung "erworbenen Eigenschaften" und Auslese. (**The inheritance of acquired characters**).

Gustav Fischer, Jena 1938 : Bound RM. 18.50, Unbound RM. 17.

Pp. xii + 346. 80 figs. 12 tables.

The much discussed and still unsettled question of the inheritance of acquired characters is critically examined.

The first part of the book is occupied with a statement of the problem and includes an analysis of the term "inheritance of acquired characters". This is not considered in its narrowest sense as a change taking place during the life of an individual and passed on to the progeny but is formulated as "the changes in the inheritance factors and their transmission in the changed condition". From this point of view biologists will probably agree that the answer to the question "are acquired characters inherited?" is "yes". The second part of the book is devoted to the discussion of four main problems:—(1) The question of the inheritance of acquired characters without regard to cause and adaptation, (2) their inheritance with regard to the question of cause alone, (3) their inheritance with regard to adaptation alone, and (4) their inheritance in relation to the questions of cause and adaptation taken together. Lamarck's theory of the inheritance of acquired characters is shown to be untenable, but modern research in genetics and cytology has demonstrated the transmission of changes in the genes, however caused.

Data are provided from plants, animals and man, and this critical and detailed study should do much towards the elucidation of a much vexed subject. Some notes amplifying the text are appended, there is a useful glossary and the book is well indexed.

DEWAR, D.

576.12

More difficulties of the evolution theory and a reply to "Evolution and its modern critics".

Thynne and Co. Ltd., London 1938 : 8s. 6d. Pp. x + 206. 6 illus.

It is clear that many details of the mechanism of evolution are still obscure, and that no conclusive experimental evidence is yet available to support certain important points in the theory. A book of this nature may therefore be of considerable value, especially to those who are apt to accept evolutionary arguments too uncritically, and to indulge in loose thinking on the subject. Unfortunately, however, many of the author's arguments are distinctly dubious. We have very strong evidence of the origin of new species in nature. The classic example of *Spartina Townsendii* may be cited. Yet the author states that no case is definitely known where new species have arisen naturally. The statement is also made that only one commonly occurring hybrid between distinct species is known. The author is apparently unfamiliar with the innumerable interspecific hybrids commonly occurring between fruit trees, not to mention at least two inter-generic hybrids in the Gramineae, *Aegilops x Triticum* and *Festuca x Lolium*. The author quotes and endorses the statement

of Caullery that "to-day we feel farther from representing how evolution has been effected than forty years ago. . . ." It is true that we have a much better understanding of the difficulties involved, but it can scarcely be doubted by the reader of such a book as Dobzhansky's *Genetics and the Origin of Species* that considerable progress has been made in their solution.

FLEMING, A.

576.12

Evolution or creation?

Marshall, Morgan and Scott Ltd., London and Edinburgh. 2nd ed. 3s. 6d.

Pp. ix + 114.

The author states in his preface that the theory of human evolution is a "strange doctrine contrary to God's word in effect and aim", and devotes a large part of one chapter to an attempt to show that man cannot have evolved from animal ancestors. He considers that the "doctrine" of evolution cannot be accepted because it fails to account for the origin of matter or of life. He also brings forward a number of arguments against Darwin's evolutionary hypothesis.

NICOL, H.

577.17:581.14:578.088.1

Plant growth-substances. Their chemistry and applications, with special reference to synthetics.

Leonard Hill, Ltd., London 1938 : 3s. 6d. Pp. xii + 108. 6 figs.

This book is based on a series of three articles which appeared in the *Manufacturing Chemist* in the summer of 1937, to which a number of new chapters have been added. It forms a very valuable summary of the present state of knowledge of plant growth-regulating substances, both from the chemical and physiological points of view. In the first two chapters the purely practical uses of the substances in horticulture are described, with hints as to the requisite concentrations and mode of application for the rooting of cuttings.

Then comes a chapter on the synthesis of indole-acetic acid (heteroauxin) and related organic compounds, followed by a chapter in which the more important research work on the action of growth-substances on the plant is summarized.

The natural sources of these substances are dealt with in two chapters, and succeeding sections deal with experiments on the growth-regulating effect of specific compounds, and with chemical nomenclature. Of special interest is the suggestion that the particular virtue of rotted organic manures is that they contain decomposition products of proteins which act as growth-promoting substances. The author points out that practically no research work on this aspect of the chemistry of organic manures has been done. As an aid to such work, analytical methods for the detection of various growth-promoting substances are summarized. This is of particular value, since, as the author states, such details have previously been scattered through medical and physiological journals which are not easily available to agricultural chemists. In a final chapter a list is given of the more important growth-regulating substances, with references to their physiological and physico-chemical properties. The book contains an adequate bibliography. It is unfortunate that much valuable material is rather badly arranged, new chapters having been added in a rather random fashion to the matter of the original three articles.

FRITSCH, F. E. and

58

SALISBURY, E. J.

Plant form and function.

G. Bell and Sons Ltd., London 1938 : 17s. 6d. Pp. viii + 668. 445 figs.

In this book the substance of two previous works by the same authors, *An Introduction to the Study of Plants* and *An Introduction to the Structure and Reproduction of Plants* has been brought together, with many additions and modifications which bring it up to date. The scope of the work has been somewhat extended, more emphasis being placed on the physiological and ecological aspects. A chapter on the British Flora is added.

This book forms an excellent text-book of general botany, dealing as it does with plant anatomy, morphology, physiology, ecology, systematics and biochemistry. It should be very

valuable in the first year of University work and also to secondary school pupils taking botany as a Higher School Certificate subject.

PRIESTLEY, J. H. and
SCOTT, L. I. 58
**An introduction to botany with special reference to the structure
of the flowering plant.**
Longmans, Green and Co., London, New York and Toronto 1938 : 17s. 6d.
Pp. x + 615. 170 figs.

For this introductory study the authors have taken as their basis the first year's course in botany at the University of Leeds: and assuming no previous knowledge, the student is led gently through a study of the externals of the living plant, beginning with the seed and following its natural growth up to the structure of the leaf, at which point the necessity for a closer examination of the components of the plant brings the microscope into prominence. Thereafter microscopic examination is included in the elucidation of the problem of growth and development. Plant in hand, as it were, the student is introduced step by step to the essentials of botany and though the emphasis is mainly on the structure of the flowering plant the physiological experiments quoted throughout the work are all within the range of a class working for short periods of time and some of the methods and technique described have been specially worked out and perfected for this course. The admirably clear and very numerous drawings are of uncommon accuracy and constitute a very essential part of the book. Chapters are also devoted to the fungi as parasites and saprophytes; life cycles throughout the plant kingdom; the nucleus and heredity and to plant classification.

HECTOR, J. M. 58:633
58:635
**Introduction to the botany of field crops. Vol. I. Cereals. Vol. II.
Non-Cereals.**
Central News Agency Ltd., Johannesburg, South Africa 1938 : £3. 10s. the
set. Pp. xii + 478 + xiii–xxxiv. 190 figs.; Pp. viii + 479–1127 + ix–
xxxiii. 191–448 figs. (S. Afr. Agric. Ser. Vol. 16).

This book should be of the very greatest value to teachers and students of agricultural botany. It deals very comprehensively with the morphology, physiology, systematic botany, cytology and species relationships of all the important agricultural crops and many vegetables, the only notable omission being that of the grasses. The book is well illustrated and produced, and each chapter contains an adequate bibliography. The first volume deals entirely with Graminaceous crops, cereals and sugar cane, and the second volume with crops belonging to other families.

It is, of course, impossible for the author of a book of such a wide scope as this to avoid certain omissions and misrepresentations, though these appear to be very few in the present publication. In dealing with the description of the wheat species, the author omits any reference to the very distinct and characteristic group of tetraploid wheats which are found in Abyssinia. He also omits a description of the species *Triticum persicum*. In his treatment of the classification of the genus *Brassica*, he does not take into consideration recent cytological work which is actually described later in the chapter.

In spite of these minor deficiencies, however, this is one of the most valuable books on the botany of the field crops yet published in the English language.

WILDEMAN, É. de 581.162.5:582
Intersexualité, unisexualité chez quelques Phanérogames. Tendance vers
la stérilité ou la fécondité. Apparition, disparition d'espèces. (**Inter-
sexuality, unisexuality in some Phanerogams. Tendency towards
sterility or fertility. Appearance, disappearance of species.**)
Mém. Acad. R. Belg. Cl. Sci. 1936 : 15 : Sér. 2 : Pp. 168. (Published by
Marcel Hayez, Imprimeur de l'Académie Royal de Belgique, Bruxelles.
Price 20 fr.).

A discussion of the occurrence and origin in certain flowering plants of various mechanisms

which tend to prevent self-fertilization. Protandry, protogyny, unisexuality, heterostyly, degeneration of stamens and partial and total self-sterility are among the phenomena discussed. Although most of the plants taken as examples are of no economic importance, the following crop plants are included: avocado, pistachio, *Musa*, cacao and coffee.

SAFTENBERG, F. 582:030.8
Botanisches Wörterbuch. Erklärung und Ableitung der botanischen Gattungs- und Artenbezeichnungen mit Angabe richtiger Betonung. (Botanical dictionary. Explanation and derivation of botanical names of genera and species with the correct accentuation). Hachmeister and Thal, Leipzig, RM. 1.40. Pp. 175.

THURING, F. R. 631.541:578.08
Die wichtigsten Veredlungsarten und ihre Anwendung. (The most important types of grafting and their use). Hachmeister and Thal, Leipzig, RM. 0.35. Pp. 48. 35 figs.

The first publication is a compact dictionary which aims at providing the German plant lover with the derivation and meaning and correct accentuation of generic and specific plant-names originating from Latin, Greek or other languages.

The main contents are arranged in three parts, comprising the generic, the specific and the German names, which are alphabetically set out in their respective sections. An explanatory list is also given of symbols and abbreviations used in botanical systematic nomenclature. In addition a short section is included giving the more frequently employed suffixes from Latin and Greek, with their meanings and the accentuation for any adjectival forms which they may be used to compose. Genders are given where required.

The print is admirably chosen for its purpose and the user will be further aided by the two key words at the top of each page indicating its alphabetical range.

The book can be recommended to all with an adequate knowledge of German who require information on the etymological aspects of botanical nomenclature.

The second booklet, which is illustrated, deals concisely with grafting from the following aspects:—physiological explanation of grafting, use of buds or scions, causes of failures, equipment and the most important types of grafts, to which the main portion of the book is devoted.

63.00.15(42)
Report on agricultural research in Great Britain. A survey of its scope, administrative structure and finance, and of the methods of making its results known to farmers, with proposals for future development.

PEP (Political and economic planning), 16, Queen Anne's Gate, London 1938 : 8s. 6d. Pp. 146.

The organization and financing of agricultural research and extension work in Great Britain are described in a general way. The various research institutes, Imperial Agricultural Bureaux, extension services and other organizations concerned either with conducting agricultural research or with disseminating its results are listed, and the function of each briefly indicated. The conditions of employment in the agricultural service are touched upon. In a final chapter, certain criticisms of the present system are made. It is suggested that the Development Commission is a superfluous body, the agricultural functions of which should be transferred to the Agricultural Research Council, which in turn should have its executive powers enlarged so that it becomes a central clearing house for all matters relating to agricultural research; that new series of Research Institutes organized on a husbandry or product basis should be brought into being; that the provincial advisory service should be organized on a husbandry basis and not on a science basis as at present; that a series of Imperial Bureaux working on a similar basis should also be founded.

From the point of view of personnel, it is suggested that the salary scales at present applying to agricultural research workers are so low that many of the best men are being attracted into private industry; this is particularly so in veterinary work, private veterinary practice being much more lucrative than research work.

The foundation of a new Central Extension Service, under the control of the Agricultural Research Council and responsible for all extension work, is considered advisable.

ÅKERMAN, Å.,
GRANHALL, I.,
NILSSON-LEISSNER, G.,
MÜNTZING, A. and
TEDIN, O.
Swedish contributions to the development of plant breeding.
Alb. Bonniers Boktryckeri, Stockholm 1938 : \$1.00. Pp. 111. illus.
9 tables.

633:575(48.5)

In this interesting little book the organization and main results of plant breeding work in Sweden are described and the lines along which further improvement of agricultural crop plants is being attempted are indicated. Most of the book is naturally concerned with the work of the Sveriges Utsädesförening (Swedish Seed Association), which has its main plant breeding station at Svalöf and eight branch stations in various parts of the country. The organization of this Association is described, and details given of its relations with the General Swedish Seed Company, which takes care of the propagation and marketing of the products of the plant breeding stations.

The book contains a brief historical survey of the development of breeding methods and field-plot technique at the Svalöf station, and details of the main results and lines of development of breeding work on oats, barley, wheat, rye, root crops, potatoes, grasses and clovers. As well as the more orthodox breeding work, some attention is being paid to the development of new crops by the induction of polyploidy. Tetraploid barleys, various wheat-rye hybrids and a 63-chromosome strain of timothy are being studied.

An effort is made, by co-operative variety testing and selection work at the various sub-stations, to breed new varieties with as wide a range of adaptation as possible, but the sub-stations are also necessarily partly occupied with the work of breeding work of breeding varieties to suit particular local conditions.

The annual income of the Sveriges Utsädesförening is about 400,000 Swedish crowns, of which about three-quarters is received from the government. It is estimated that the annual gain to Swedish agriculture resulting from scientific plant breeding work in that country is at least 100,000,000 Swedish crowns.

633.16:663.421

633.79

HIND, H. L.
Brewing science and practice. Vol. I. Brewing materials.
Chapman and Hall Ltd., London 1938 : 50s. 0d. Pp. xiv. + 505. 63 figs.
150 tables.

In the author's preface it is stated that this book has been written for brewers and those engaged in the scientific side of brewing, but there can be no doubt that it will also be of great interest to barley breeders. Indeed, the work is of general interest in showing how far investigations into the important question of quality can go without reaching a completely definitive answer.

After a brief historical chapter, the book is divided into parts entitled respectively: barley; an introduction to the biochemistry of malt and wort; malt; sugar, specific gravity, extract and polarimetry; hops; water. The part on barley comprises chapters on the structure and classification of barley, malting barleys, physiological characters of barley, and on the composition and quality of barley. The variety problem is given considerable prominence and there is no doubt that it is this part which is of most interest to the breeder, though the viewpoint is, as has been stated, the brewer's rather than the agriculturist's. To mention only two points, the formulae for predicting extract from nitrogen content and thousand-corn-weight

are dealt with at some length and the author has much of value to report on nitrogen and proteins.

The varietal question is also considered in the part on hops.

The rest of the book is perhaps rather too detailed for the average breeder, who probably has neither the time nor the equipment for such refinements, but this is not to say that he would not benefit from a careful perusal of it.

A useful feature of the book is the provision of summaries at the ends of certain chapters. References are provided at the end of each chapter, though we are sorry to note that the author adopts the growing practice of not giving titles. Name and subject indexes are given and the book ends with some useful conversion tables. An unfortunate looseness in writing or proof correction mars the book here and there. For instance we extract the following from a rather long sentence on p. 31: "the plants of the F_2 generation would vary in such a way that . . . half would resemble the hybrids of the F_2 generation". Nevertheless we feel that the book is one to be recommended.

J. L. F.

BROWN, H. B. 633.51
Cotton. History, species, varieties, morphology, breeding, culture, diseases, marketing, and uses.
McGraw-Hill Publishing Company, Ltd., London 1938 : 2nd ed. 30s. 0d.
Pp. xiii + 592. 140 figs. 72 tables.

This excellent text-book on cotton in all its aspects has now been brought up to date in a new edition. Considerable progress has been made in cotton research and technology since the book first appeared in 1926, and this has necessitated many detailed revisions and additions to the text. The general plan of the book, however, remains the same.

The book should be of considerable service to plant breeders. It contains useful sections on the taxonomy of the genus *Gossypium* and the physiology of the cotton plant, as well as descriptions of the more important cotton varieties of the world. In the chapter on Variation, Heredity and Correlation a description is given of mode of inheritance of many of the genetic characters of cotton, together with notes on the occurrence of mutations and bud sports. The chapter on Cotton Breeding deals broadly with the various breeding methods which have been employed, with the technique of pollination and strain testing, the amount of natural cross-pollination, and various other aspects of the problem of cotton improvement.

NORTH COOMBES, A. 633.61(69.82)
The evolution of sugarcane culture in Mauritius with a chapter on the evolution of the Mauritian sugar factory.
The General Printing and Stationery Co., Ltd., Port Louis, Mauritius 1937 :
Pp. xv + 197. 14 tables.

This book gives a very readable account of the history of the cultivation of sugar cane in Mauritius from its first introduction to the present day. The methods of cultivation at various periods are described, and an account given of the introduction, spread and subsequent history of the various pests and diseases of sugar cane which have reached the island. The varieties which have been grown are described, and at the end of the book there is an interesting chronological table of the main events which have influenced the Mauritian sugar industry. One chapter is devoted to a description of the development of methods of sugar extraction and refining in the island, from the original "frangorine", a kind of mortar and pestle, to the modern factory.

HEDRICK, U. P. 634(7)
Cyclopedia of hardy fruits.
The Macmillan Company, New York 1938 : 25s. 0d. 2nd ed. Pp. viii + 402. 350 figs. 14 pls.

Mr. Hedrick's well-known *Cyclopedia of Hardy Fruits* gives descriptions, arranged alphabetically, of varieties of apples, crab-apples, pears, quinces, apricots, cherries, nectarines, peaches, plums, grapes, raspberries, blackberries, dewberries, currants (*Ribes*), gooseberries, cranberries, blueberries, huckleberries, strawberries and some miscellaneous fruits. The second

edition is stated to have been revised throughout and is provided with a supplement giving descriptions of varieties which have come into importance since the first edition was published in 1922. The code of Fruit Nomenclature of the American Pomological Society, a glossary, an index to species and an index to synonyms are provided. There is no bibliography. The varieties described are, of course, chiefly North American. The parts dealing with the different groups of fruits (pomes, drupes, etc.) are prefaced with a botanical chapter and a useful detail is the provision of description blanks.

J. L. F.

HOULBERT, C.

634.11(44)

Tableaux analytiques illustrés de pomologie (Pommes de table). Choix des principales variétés cultivées en Anjou, Bretagne et Normandie. [Illustrated analytical tables of pomology (Dessert apples). Selection of the principal varieties cultivated in Anjou, Brittany and Normandy].

Imprimerie de l'Ouest-Eclair, Rennes 1937 : 24 fr. Pp. 106. 67 figs.

For purposes of classification two main types are distinguished, Reinettes and Calvilles. These are then subdivided on the basis of shape and again on differences of the peduncle, the eye and the ocular cavities. In the analytical tables the main types are illustrated by black and white drawings.

PEDERSEN, A.

634.11(48.9)

Danmarks Frugtsorter. I. Aebler. (Danish fruit varieties. I. Apples). Gartnerforenings Bogforlag, København 1938 : Kr. 6.50. Pp. 64. illus.

This is the first number of a descriptive work on certain Danish fruit varieties. Two volumes are already planned, Vol. I, apples and Vol. II, pears, plums and cherries, and it is hoped that Vol. III on other fruits and Vol. IV on nuts may follow.

The present number includes 16 varieties and other numbers will follow. Each variety has a large and beautifully coloured plate of two or three forms of the ripe fruit, a half cut longitudinally and a leafy twig—as well as photographs of the blossom and of old and young trees. In the text are given the synonyms, a history of the variety, descriptions of the tree and fruit, cultural notes, resistance to diseases and pests and an account of the economic value of the variety.

CRONBACH, W.

634.51

Die Walnuss (*Juglans regia*) und ihre Sorten im Schrifttum. [The walnut (*J. regia*) and its varieties in the literature].

Gartenbauverlag Trowitzsch and Sohn, Frankfurt and Berlin 1938 : RM. 3.50. Pp. 59. 8 pls.

This book is one of a series entitled "Sources for the History of Horticulture" published under the auspices of the German Horticultural Society. Its aim is to summarize the literature on the varieties of walnuts. The introductory chapters are followed by descriptions of some 144 varieties, divided into eight groups. A numbered bibliography is provided, with 406 references and a table is given from which the references on any variety can quickly be found.

Doubtless owing to the fact that both sexual and vegetative propagation is practised with walnuts, the conception of variety seems somewhat hazy in this crop. The author, who is, we are told in the foreword, an amateur at gardening, modestly denies any claim to definitiveness for his work, but there is no doubt that it is of considerable value for those interested in the varietal question in walnuts.

J. L. F.

DERSAL, W. R. van

634.9(73)

Native woody plants of the United States, their erosion-control and wildlife values.

Miscl. Publ. U.S. Dep. Agric. 1938 : No. 303 : Pp. 362. 44 pls. (For sale by the Superintendent of Documents, Washington, D.C.). Price \$1.75.

This work, which first appeared in preliminary mimeographed form in 1936, has now been re-published in a much more complete form. It contains a list of the woody plants of the

United States arranged in alphabetical order of their botanical names. Synonyms are also included in the list. The descriptions include notes on range, type of fruit, growth habit, ecology, flowering period, method of propagation, pests and diseases. Stomach records and observations are added to indicate the importance of each species as food to wild birds and game.

In an introductory chapter, the United States is divided into plant-growth regions which are later used in describing the range of each plant. Two large maps are included in the volume, showing the relation of these plant growth regions to the climate and soil regions of the States.

RANDALL, C. E. and
EDGERTON, D. P. 634.97(73)

Famous trees.

Misc. Publ. U.S. Dep. Agric. 1938 : No. 295 : Pp. 116. 50 figs. (For sale by Superintendent of Documents, Washington, D.C., Price 15 cents).

This booklet (Cf. "Plant Breeding Abstracts", Vol. VII, p. 264) has been revised in detail throughout, and more illustrations have been added. It contains brief accounts of American trees famous for their associations with notable persons, events or places, or notable for their unusual size or age.

635
BECKER, J. 635:575
Handbuch des Gesamten Gemüsebaues einschliesslich des Gemüsesamenbaues, der Gewürz- und Küchenkräuter auf praktisch-wissenschaftlicher Grundlage unter besonderer Berücksichtigung exakter Pflanzenzüchtung. (**Text-book of the whole of vegetable cultivation inclusive of vegetable seed production, of aromatic and culinary herbs on practical and scientific bases with special consideration of exact plant breeding**).

Paul Parey, Berlin 1938 : RM. 34. 3rd ed. Pp. xv + 872. 429 figs.

The appearance of three editions of a text-book in 14 years is a sure sign that it fulfils a useful purpose. Its aim is to describe vegetable cultivation, seed production and breeding.

The book is divided into three sections, the first dealing with horticulture in general and the second with vegetable seed production in general. In the third, which makes up the major part of the book, the different plants are considered one by one and very fully. The plants are classified botanically, starting with the dicotyledons, from *Polygonaceae* to *Compositae*, then the monocotyledons, *Graminae* (maize) to *Convallariaceae* (asparagus) and finally the fungi (mushroom). The space devoted to the different plants naturally varies with their importance. *Brassica oleracea* and its varieties for instance occupies 100 pages while such plants as rue, borage and coriander are dismissed in a page or two. The range of plants mentioned is wide and a great deal of information is given on the more important plants, including botanical, genetical, varietal and breeding information, making the book of great value as a reference work for plant breeders.

An index is provided but the only bibliography is a list of eight German books described as "new literature to the Third edition". The book is well illustrated with photographs and drawings. The work is to be considered as Vol. IV of the author's "Handbuch des gesamten Pflanzenbaues" ("Text-book of the whole of plant cultivation").

J. L. F.

GRAY, G. D. 635.655
All about the soya bean. In agriculture, industry and commerce.
John Bale, Sons and Danielsson, Ltd., London 1936 : 7s. 6d. Pp. viii + 140. 7 illus.

In this little book most aspects of the cultivation and utilization of the soya bean are dealt with. The cultivation of the bean in China and Manchuria is described, and the story told of its introduction as a crop plant into the United States, with its subsequent rapid expansion, aided by the continued introduction, testing and breeding of new varieties by the federal government and other agencies. The crop has not yet been successfully acclimatized to

English conditions. Varieties have been produced which give excellent yields in a hot, dry summer, but the crop is as yet a failure in a cool, wet season.

The book contains chapters on the uses of the bean as human food, and the uses of soya bean oil in industry. Its food value is particularly high, and it is a much cheaper form of protein than meat. Since soya bean flour contains practically no starch, it should become an important article of diet for diabetics.

In an interesting introductory chapter to the book, Mr. J. L. North describes his efforts to acclimatize the crop for growth in England.

NEW JOURNAL

The Australian Journal of Science.

This new journal is to be published six times a year by the Australian National Research Council under the auspices of the Australian and New Zealand Association for the Advancement of Science.

Scientific work in Australia has developed considerably during recent years and the new journal is to provide a channel for the publication of short advance summaries of research in progress and information on current scientific work of the general scientific reader. Book reviews, correspondence on matters of scientific importance, personal and topical news, the proceedings of scientific societies and the reports of the activities of Universities and National Laboratories will also find a place in the new publication.

The present issue in addition to articles of biological interest (including botanical and geographical surveys of regions of Australia) contains the current issue of Australian Science Abstracts which includes classified abstracts on agriculture, chemistry, economic and statistics, veterinary science, zoology and entomology and will in future appear as a supplement in the Australian Journal of Science.

Contributions from readers are invited. (Published by the Australian National Research Council, Sydney, New South Wales, Australia, subscription twelve Australian shillings per annum, post free).

INDEX

- A**baiza, F., 318
 Abbott, E. V., 346
 Abeele, M. van den, 392
 Abegg, F. A., 353, 360, 373
 Åberg, E., 261
 Adair, C. R., 274, 276
 Adam, D. B., 84
 Agapov, S. P., 294
 Åkerberg, E., 280
 Åkerman, Å., p. 147
 Akh, Z., see Akhun-Zade
 Akhund-Zade, see Akhun-Zade
 Akhun-Zade, I., 451–453
 Akkoyunlu, Z., 384
 Alam, N. Ch., see Nek Alam, Ch.
 Alderman, W. H., 420
 Alešin, E. I., 104, 465
 Alpat'ev, A. V., 536
 Ammal, E. K. Janaki, see Janaki Ammal, E. K.
 Anan'eva, S. V., 406
 Andreev, V. N., 421
 Anonymous, 29, 30, 47, 48, 50, 64,
 65, 66, 68, 69, 77, 81, 82, 93,
 101, 102, 221, 324, 343, 347,
 350, 411, 414, 437, 464, 492,
 p. 146
 Arassimovich, V. V., 528
 Arghirescu, V., 376
 Arutiunova, N. S., 379
 Arwidsson, T., 143
 Avanzi, E., 167
 Ayyangar, G. N. Rangaswami, see
 Rangaswami Ayyangar, G. N.
 Ayyar, M. A. S., see Sankara
 Ayyar, M. A.
 Azmat Singh, 23
 Bakhteev, F. Kh., 254
 Barnardo, W. S. E., 71
 Bartlett, M. S., 26
 Batrakov, M. A., 535
 Bauer, G., 469
 Beachell, H. M., 274
 Beams, H. W., 134
 Beatus, R., 144
 Becker, J., p. 150
 Beckett, R. E., 320
 Bedi, K. S., 94
 Belorossova, N. V., 523
 Berg, K. H. von, 183
 Berliner, E., 213
 Birkinshaw, F., 89
 Bjerke, Bj., 96
 Black, A. G., 57
 Boerger, A., 329
 Boguslawski, E. von, 215
 Boiteau, P., 374
 Bolsounov, see Bolsunov
 Bolsunov, I., 377
 Bonnett, O. T., 263
 Bordonas, M. G., 363
 Bottger, G. T., 252
 Bougy, E., 354
 Braun, H., 317
 Bredemann, G., 253
 Breider, H., 481
 Bremekamp, C. E. B., 121
 Brewbaker, H. E., 348
 Brieger, F. G., 240, 242
 Broekema, 148
 Brown, H. B., p. 148
 Buchinger, A., 131
 Bulaševič, N. Ě., 281
 Bundschuh, R., 389
 Burnett, L. C., 227
 Busse, J., 482, 496, 497
 Calder, R. A., 31
 Candioli, P., 440
 Capipin, J. M., 271
 Cardoso, C. P., 174
 Carpenter, P. H., 63
 Carsner, E., 371
 Catchside, D. G., 521
 Ceresa, G., 340
 Černomaz, P. A., 201
 Ch., p. 139
 Chatters, R. M., 116, 117
 Cheesman, E. E., 78
 Chiappelli, R., 272
 Chiarugi, A., 106
 Chopinet, R., 330
 Christiansen-Weniger, F., 212
 Cochran, W. G., 1, 25
 Coffman, F. A., 227
 Coleman, O. H., 283
 Collins, J. L., 470
 Conant, R. K., 341
 Coolhaas, C., 149, 395
 Coons, G. H., 358, 368
 Cope, F. W., 73
 Cowart, F. F., 436, 475
 Craig, J. I., 33
 Craig, W. T., 153
 Crescini, F., 107
 Cronbach, W., p. 149
 Čvašaev, T. Z., 541
 Dahlberg, H. W., 365
 Dana, B. F., 530
 Darlington, C. D., 9
 Davidson, W. D., 44
 Davis, L. L., 274
 Deming, G. W., 351
 Dersal, W. R. van, p. 149
 Deržavin, A., 180, 194
 Deshpande, R. B., 58
 Dewar, D., p. 143
 Dianova, V., 417
 Didus', V. I., 257, 258
 Dimošin, S. I., 432
 Dobzhansky, Th., 239
 Doorenbos, S. G. A., 491
 Doxtator, C. W., 355
 Dudok van Heel, J. P., 356
 Dumitrescu, C., 378
 Dutt, N. L., 60
 Ebiko, K., 195
 Edgerton, D., p. 150
 Edwards, D. W., 455
 Eichhorn, A., 459
 Elizarova, S. S., 262
 Ellison, W., 37
 Emme, E. K., 308
 Emme, H., 222, 225 *
 Emsweller, S. L., 513
 Enin, T. K., 542
 Ermakov, A. I., see Yermakov, A. J.
 Ernst, A., 146
 Fabricius, L., 498
 Fahey, H., 71
 Fedorčenkov, A. V., 546
 Fedorov, G. V., 515
 Fiala, A., 476
 Fischer, A., 289, 533
 Fisher, R. A., 3, p. 141
 Fitch, C. L., 305
 Fleming, A., p. 144
 Fleming, C. W., 71
 Floor, J., 157
 Ford, C. E., 333
 Forester, H. C., 150
 Frankel, O. H., 15
 Friedl, G., 300
 Frimmel, F., 503
 Frischenschlager, B., 429
 Fritsch, F. E., p. 144
 Gaddum, E. W., 51
 Gaskill, J. O., 351
 Gates, R. R., 16
 Gd., 466
 Gescher, N. v., 98
 Gilbert, S. M., 28
 Gliemeroth, G., 214
 Goluninskij, J. N., 419
 Goodspeed, T. H., 385
 Gorjunov, D., 188
 Gorst, G. F., 237
 Gortikova, N. N., 382
 Goto, K., 154
 Graner, E. A., 242, 243
 Granhall, I., 219, p. 147
 Gray, G. D., p. 150
 Grebennikov, P. E., 168, 196, 255
 Grebinskaya, M. I., 298
 Grisko, N. N., 331
 Grossman, A. M., 247
 Guinochet, M., 284
 Gustchin, G.-G., 273
 Gyland, K., 209
 Györffy, B., 140
 H., A. G., 4
 Hackbarth, J., 291
 Haddon, C. B., 325
 Hafekost, G., 369
 Hagedoorn, A. C., 121
 Hagedoorn, A. L., 121
 Hahn, G. G., 461
 Halma, F. F., 450
 Hance, F. E., 344
 Hand, D. B., 249

- Harlan, H. V., 259
 Harper, R. E., 326
 Harter, L. L., 545
 Hartley, C. P., 245
 Hartley, H. O., 22
 Haskins, C. P., 267
 Hector, J. M., p. 145
 Hedrick, U. P., p. 148
 Heel, J. P. D. van, see Dudok van Heel, J. P.
 Heilborn, O., 130
 Heimans, J., 400
 Hell, W. F. van, 412
 Herrera, F. L., 304
 Hershey, J. W., 486
 Hertzsch, W., 279
 Heyn, A. N. J., 393
 Higgins, B. B., 456
 Hind, H. L., p. 147
 Hoffmann, W., 332
 Hofmeyr, J. D. J., 85
 Holmes, F. O., 386
 Honecker, L., 265
 Hoogland, J. J., 95
 Hosking, H. R., 5
 Houlbert, C. p. 149
 Hübner, R., 287
 Hugues, P., 181
 Huitema, W. K., 155
 Hull, F. H., 238
 Humphrey, H. B., 227
 Humphrey, N., 6
 Hurel-Py, G., 430
 Husfeld, 502
 Husfeld, B., 472, 481, 483, 502
 Huskins, C. L., 129
 Hutchinson, J. B., 49, 53, 55, 56
 Imai, Y., 105
 Immer, F. R., 162
 Ivanov, N. N., 159
 Ivanov, P. P., 424
 Iwanoff, see Ivanov
 Iwata, K., 216
 Jagger, I. C., 529
 Jakimova, E. I., 179
 Jakimović, A. D., 531, 532
 Jakubtsiner, see Jakubziner
 Jakubziner, M. M., 197, 200
 Jameson, J. D., 54
 Janaki Ammal, E. K., 59
 Jenkins, R. R., 548
 Jensen, H. W., 375
 Jodon, N. E., 274
 Johnston, C. O., 211
 Johnston, S., 438
 Jones, H. A., 513
 Jones, J. W., 274, 276
 Judin, A. F., 260
 Juneau, V., 480
 Kadam, B. S., 34
 Kagawa, F., 277, 312
 Kaplan, N. M., 198
 Kasparjan, see Kasparyan
 Kasparyan, A. S., 177
 Kattermann, G., 186
 Kerkis, J. J., 114
 Kerkis, Ju. Ja., see Kerkis, J. J.
 Kerns, K. R., 470
 Khimič, P. E., 518
 Khudyna, J. P., 388
 Kihara, H., 135, 192
 Killough, D. T., 326
 King, C. J., 320
 King, R. L., 134
 Knapp, E., 113
 Kolesnik, I. D., 118
 Komatsu, T., 302
 Kontar, E. S., 202
 Kopel'kivskii, G. V., 218
 Kopetz, L. M., 517
 Korobeinikova, 169
 Kostina, V. N., 460, 462
 Kostoff, D., 17-21, 35, 61, 62, 178, 208, 379
 Kostov, see Kostoff
 Kovalevskii, L. I., 166
 Kovarskii, A. E., 233
 Kraevoi, S. Ja., 115
 Krajevoi, see Kraevoi
 Krajevoj, see Kraevoi
 Krantz, F. A., 306
 Krayevoy, see Kraevoi
 Kreutz, H., 286
 Krishnaswami, M. K., 60
 Krivenko, A. A., 516
 Kröner, W., 314
 Kučumov, P. V., 170, 176, 198
 Kulkarni, R. K., 34
 Kunhikoran Nambiar, A., 42
 Kuriyama, H., 301
 Kurkin, M. P., 199
 Kuwada, Y., 124
 Lander, P. E., 23
 Lantz, H. L., 427
 Lapin, V., 442
 Larsen, C. S., 90
 Lauche, K., 503
 Legros, J., 319
 Leliveld, J. A., 103
 Lennox, C. G., 345
 Leonov, I. M., 426
 Lesage, P., 527
 Lesley, M. M., 537
 Levitski, see Levitsky
 Levitskij, see Levitsky
 Levitsky, G. A., 123, 136
 Liese, J., 500
 Liesegang, R. E., 110
 Lodder, H., 410
 Lounsberry, C. C., 454
 Love, H. H., 153
 Lovell, J. S., 71
 Lubimenko, V. N., 382
 Lundin, H., 266
 Luthra, J. C., 94
 McBeth, C. W., 370
 McClintock, B., 248
 McGreevy, B. F., 348
 McTaggart, A., 32
 Maksamčuk, see Maximčuk
 Mangelsdorf, P. C., 246
 Mangenot, G., 132
 Martin, J. N., 431
 Martini, M. L., 259
 Mather, K., 128, 137
 Mauri, N., 445
 Maximčuk, 230
 Medvedev, G. M., 203
 Medvedeva, G. B., 334
 Medwedewa, see Medvedeva
 Melchers, G., 111
 Melchers, L. E., 211
 Méneret, G., 100
 Michaelis, P., 112
 Midusima, U., 519
 Miège, E., 251
 Mikhailova, E., 236
 Miller, J. O., 211
 Ming, W. C., 151
 Mogiliva, A. M., 158
 Moltzau, R. H., 455
 Montagnac, 269
 Morais, A. T. de, 220, 223, 224
 Morinaga, T., 270, 301
 Morita, K., 275
 Morozov, V. K., 406
 Müller, H., 327
 Müntzing, A., p. 147
 Murphy, H. C., 227
 Murphy, M. M. (Jr), 475
 Nagamatu, T., 519
 Nakajima, G., 127
 Nambiar, A. K., see Kunhikoran Nambiar, A.
 Nandi, H. K., 43
 Narain, Ramji, 23
 Nath, B., 53
 Neal, D. C., 325
 Neal, N. P., 547
 Nebel, B. R., 126
 Negrul', A. M., 473
 Nek Alam, Ch., 10, 13
 Nesterenko, P. A., 399
 Nicol, H., p. 144
 Nilov, V. I., see Nilow, W. J.
 Nilow, W. J., 398
 Nilsson, G., 173
 Nilsson-Leissner, G., p. 147
 Nishimura, T., 344
 Nishiyama, I., 192
 Nizen'kov, N. P., 204
 Nordmann, R. O., 423
 North Coombes, A., p. 148
 Norton, H. W., 12
 Nuckols, S. B., 352
 Obermayer, E., 402
 Oehler, E., 183, 187
 Ogan'jan, V. N., 540
 Okanenko, A. S., 295
 Olmo, H. P., 479
 Ordynskii, V. V., 510-512, 546
 Orlov, P. G., 161
 Osipov, I. A., 226
 Ossent, H. P., 231
 Ostendorf, F. W., 396, 397
 Overbeek, J. van, 244, 250
 Owen, F. V., 353, 361, 362, 370, 372

- Pachev, A. G., 447
 Pal, B. P., 36, 46
 Pardi, L., 285
 Parham, B. E. V., 88
 Parker, O., 320
 Patch, L. H., 252
 Pearson, E. S., 24
 Peat, J. E., 52
 Pedersen, A., p. 149
 Pesola, V. A., 164, 172
 Petersen, N., 184
 Petrov, A. V., 422
 Philp, J., 38
 Pickett, B. S., 427
 Pickett, T. A., 475
 Plate, L., p. 142
 Poddubnaja-Arnoldi, V., 417
 Ponnaiya, B. W. X., 40
 Pope, O. A., 152
 Popoff, A., 297
 Popova, E. M., 520
 Porter, D. R., 529
 Posnette, A. F., 74
 Posnjak, A. D., 409
 Prakken, R., 383
 Pratassenja, G. D., 142, 441
 Prentice, A. N., 52
 Pressley, E. H., 322
 Priestley, J. H., p. 145
 Prooss, A. G., 457, 458
 Propach, H., 309, 310
 Pruss, A., see Prooss, A. G.
 Punyasingh, K., 271
- Radeloff, H., 253
 Ramji Narain, see Narain, R.
 Randall, C. E., p. 150
 Randolph, L. F., 249
 Rands, R. D., 346
 Rangaswami Ayyangar, G. N., 40–42
 Rao, K. S. Subba, see Subba Rao, K. S.
 Raymond, L. C., 8
 Reddy, T. Venkataramana, see Venkataramana Reddy, T.
 Redinger, K., 145
 Reeves, R. G., 246
 Reichelt, K., 526
 Reinholt, J., 534
 Reznikov, F., 171
 Rhoades, M. M., 239
 Richmond, T. R., 326
 Ripperton, J. C., 455
 Robertson, D. W., 283
 Robinson, J. L., 241
 Rockhill, H., 467
 Röder, K., 525
 Roelofsen, P. A., 397
 Roemer, Th., 165, 359, 367, p. 142
 Rohmeder, E., 484
 Rosenstiel, K. von, 210
 Rost, H., 489
 Rubin, B., 160
 Rudloff, C. F., 147
 Rudnitskii, N. V., 232
 Rudorf, W., 99, 163, p. 142
 Ruggles Gates, R., see Gates, R. R.
 Ruttle, M. L., 126
- Saftenberg, F., p. 146
 Salaman, R. N., 45
 Salisbury, E. J., p. 144
 Salmon, E. S., 79, 80
 Salmon, S. C., 97
 Sanidze, see Shanidze
 Sankara Ayyar, M. A., 41
 Sansome, E., 91, 92
 Sansome, F. W., 11
 Sattar, A., 94
 Saunders, A. R., 7
 Sayre, C. B., 548
 Ščeglova, see Szeglova
 Schad, C., 181
 Schander, H., 288
 Scheibe, A., 408
 Schelhorn, M. v., 286
 Scherz, W., 401
 Scheu, G., 477
 Schieblich, J., 282
 Schiemann, E., 468
 Schieters, 366
 Schmalfuss, H., 314
 Schmidt, M., 433
 Schmidt, M. V., 403
 Schmöle, J. F., 413, 416
 Schmuck, A. A., 381
 Schreiner, E. J., 487
 Schröck, O., 299
 Schulte, J. E., p. 142
 Schultz, H., 525
 Schürhoff, P. N., 327
 Schwanzit, F., 296
 Schwarz, E., 495
 Schweizer, J., 415
 Schwiegershausen, K., 428
 Scott, L. I., p. 145
 Seitz, F. W., 357
 Sekun, P. F., 108
 Sengbusch, R. v., 290, 292, 293, 328
 Sepeleva, E. M., 313
 Seshadri Sarma, P., 39
 Shamel, A. D., 439
 Shanidze, V., 448
 Sharonov, V. A., 336
 Shigenaga, M., 133
 Shinke, N., 125
 Shmargon, E. N., 234
 Siegumfeldt, G. H., 349
 Simonet, M., 141, 284, 330
 Singh, Azmat, see Azmat Singh
 Sirks, M. J., 121
 Šmargon, see Shmargon
 Smernitskaja, M. I., 235
 Šmidt, see Schmidt
 Sokolskaja, B. P., 444, 446
 Sokol'skaja, see Sokolskaja
 Solov'eva, V. K., 543
 Sosa-Bourdouil, C., 251
 Sosnin, A., 264
 Souilijaert, G., 330
 Spinks, G. T., 83
 Stanton, T. R., 227, 228
 Stefanovskii, I. A., 205
 Stelzner, G., 314, 316
 Stoffels, E., 394
 Strohmeyer, G., 488, 499
 Sturtevant, A. H., 109, 137
 Subba Rao, K. S., 60
- Šubina, A. F., 217
 Sudnov, P. E., 185
 Summers, E. M., 346
 Sun, V. G., 303
 Sveshnikova, I., 538
 Sveshnikova, I. N., see Sveshnikova, I.
 Swanson, A. F., 268
 Szeglova, O. A., 382
- Tang, Y., 27
 Tatebe, T., 504–507
 Tavares, H., 321
 Tavčar, A., 256
 Tedin, O., p. 147
 Ternovskii, see Ternovsky
 Ternovskij, see Ternovsky
 Ternovsky, M. F., 380, 387, 388
 Teterev, F., 425
 Thompson, M. G., 193
 Thompson, R. C., 524
 Thompson, W. P., 193
 Thorne, G., 370
 Thüring, F. R., p. 146
 Tikhonov, N., 434
 Timofeev, N. N., 514, 522
 Tissot, P., 339, 342
 Tkačenko, P. I., 311, 315
 Toenjes, W., 435
 Tolman, B., 364
 Topuridze, E. M., see Topuridze, K.
 Topuridze, K., 443
 Totmakov, G. V., 501, 536
 Toxopeus, H. J., 156
 Trofimets, N. Kh., 509
 Troll, H.-J., 288
 Trubitzina, E. M., 441
 Tschermak von Seysenegg, E., 182
 Tubbs, F. R., 67
 Tydeman, H. M., 87
 Tzitzin, N. V., 189
- U. N., 519
 Udal'skaja, N. L., 206
 Ukrainskii, V. T., 407
 Ustinova, E. I., 335
- Valutá, Ch., 190
 Vatsenko, see Vazenko
 Vazenko, A. A., 175
 Venkataramana Reddy, T., 40
 Venkatarayan, S. V., 70
 Verhoef, L., 418
 Veruschkine, S. M., 191
 Veruškin, see Veruschkine
 Vignoli, L., 337, 338
 Vijayaraghavan, C., 39
 Vloten, H. v., 490
 Voelcker, O. J., 72, 73, 75, 76
 Vogel, O. A., 207
- W., D. M. S., 14
 Wade, B. L., 545
 Wahlen, F. T., 278
 Wardlaw, C. W., 86
 Webber, J. M., 323
 Weimer, J. L., 544
 Wellensiek, S. J., 95, 390, 391

Went, J. C., 493, 494
Werner, H. O., 307
Weruschkin, see Veruschkine
Westergaard, M., 90
Wettstein, W. v., 485
Whelden, R. M., 267
Whitaker, T. W., 529
Wildeman, É. de, p. 145

Wilds, G. J. (Jr), 229
Winkler, H., 280
Winter, L., 508
Wittenrood, H., 122
Wright, S., 119, 120, 138
Yates, F., 2, 25, p. 141
Yermakov, A. J., 404

Yesinovskaya, V. N., 449
Zaaijer, J. W., 412
Zaumeyer, W. J., 539, 545
Zelevnikova, V. I., 463
Zimmermann, K., 290, p. 143
Zinčenko, V. E., 405
Zweigelt, F., 471, 474, 477, 478

PUBLICATIONS OF THE IMPERIAL BUREAU OF PLANT BREEDING AND GENETICS

Plant Breeding Abstracts, issued quarterly, annual subscription 25/- (within the British Commonwealth of Nations 20/-). Single copies 7/6.

INDEXES

	<i>s. d.</i>
Subject Index to Vols. I to V of Plant Breeding Abstracts	5 0
Subject Index to Vols. VI and VII of Plant Breeding Abstracts	2 6

SUPPLEMENTS TO PLANT BREEDING ABSTRACTS

Summary of Reports received from Countries exclusive of the British Empire, 1928-31. Supplement I	2 6
Summary of Reports received from Stations in the British Empire 1932-35. Supplement II	2 6

TECHNICAL COMMUNICATIONS

Plant Breeding in the Soviet Union. (Joint Publication of the Imperial Bureaux of Plant Genetics)	- -*
Vernalization or Lyssenko's Method for the Pre-treatment of Seed	- -*
Vernalization and Phasic Development of Plants	10 0

BIBLIOGRAPHICAL MONOGRAPHS		<i>s. d.</i>
Wheat Breeding Bibliography Part I ..	-	- -*
Part II ..	-	- -*
"Breeding Varieties Resistant to Disease ..	-	- -*
Breeding Resistant Varieties, 1930-33 (Supplement) ..	..	2 0
Lodging in Cereals ..	..	6
Oat Breeding Bibliography ..	..	1 6
Rice Breeding Bibliography ..	..	- -*
Bibliography on Interspecific and Inter-generic Hybridization in Relation to Plant Breeding ..	..	2 0
Account of the Research in Progress in the British Empire ..	..	3 6
Rye Breeding Bibliography ..	..	1 6
Barley Breeding Bibliography ..	..	- -*
Bibliography on Breeding Sorghums and Millets ..	..	1 0
Bibliography of Baking Quality Tests ..	..	2 6
Bibliography of Baking Quality Tests, Supplement 1933-38 ..	..	1 6
The Experimental Production of Haploids and Polyploids ..	..	5 0
The South American Potatoes and their Breeding Value ..	..	3 6
An Outline of Cytological Technique for Plant Breeders ..	..	1 6
Tobacco Breeding Bibliography ..	..	1 0

* Publications thus marked are out of print.

IMPERIAL AGRICULTURAL BUREAUX

EXECUTIVE COUNCIL.

2, Queen Anne's Gate Buildings, London, S.W.1.

IMPERIAL BUREAU OF SOIL SCIENCE.

Rothamsted Experimental Station, Harpenden, Herts.

IMPERIAL BUREAU OF ANIMAL NUTRITION.

The Reid Library, Rowett Institute, Bucksburn, Aberdeen.

IMPERIAL BUREAU OF ANIMAL HEALTH.

Veterinary Laboratory, New Haw, Weybridge, Surrey.

IMPERIAL BUREAU OF ANIMAL BREEDING AND GENETICS.

King's Buildings, University of Edinburgh, Scotland.

IMPERIAL BUREAU OF PLANT BREEDING AND GENETICS.

School of Agriculture, Cambridge.

IMPERIAL BUREAU OF PASTURES AND FORAGE CROPS.

Agricultural Buildings, Alexandra Road, Aberystwyth.

IMPERIAL BUREAU OF HORTICULTURE AND PLANTATION CROPS.

East Malling Research Station, East Malling, Kent.

IMPERIAL BUREAU OF AGRICULTURAL PARASITOLOGY (HELMINTHOLOGY).

Winches Farm, Hatfield Row, St. Albans, Herts.

The Imperial Bureau of Plant Breeding and Genetics

Director: PROF. F. L. ENGLEDOW, M.A., Drapers' Professor of Agriculture.

Deputy Director: P. S. HUDSON, Ph.D.

Assistants:

MRS. R. M. INGHAM, M.Sc.

MISS M. L. C. WILSON, B.A.

S. ELLERTON, B.Sc.

Secretary: MISS K. M. STEARN.

IMPORTANT NOTE.—Every effort is made by the staff of the Imperial Bureau of Plant Genetics to make Plant Breeding Abstracts as complete as possible and to include all papers referring to plant breeding or the genetics of crop plants with the least possible delay after publication. In order to ensure this, authors are invited to send copies of their papers immediately on publication to the Deputy Director.

Plant Breeding Abstracts are issued quarterly at an inclusive price of 25/- per annum (within the British Commonwealth of Nations 20/-) single copies 7/6 each. Subscriptions or exchanges should be sent to the Deputy Director, Imperial Bureau of Plant Breeding and Genetics, School of Agriculture, Cambridge, England.

A few back numbers of Plant Breeding Abstracts are obtainable at 35/- per volume, single numbers 10/- each.

Other publications of the Bureau appear inside the back cover.

Loss in Transit.—It is only possible for the Bureau to meet claims for numbers of Plant Breeding Abstracts lost in transit when notice of the loss is received within three months of the date of posting.